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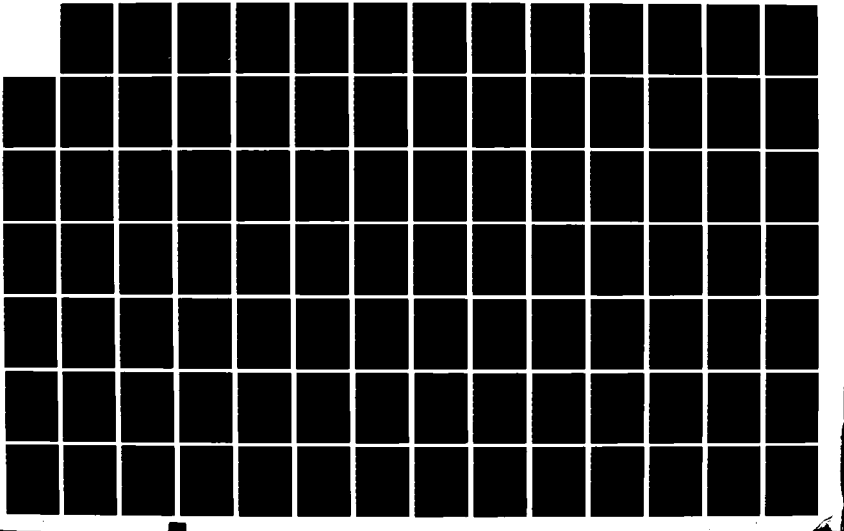

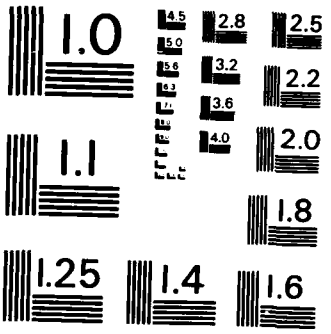

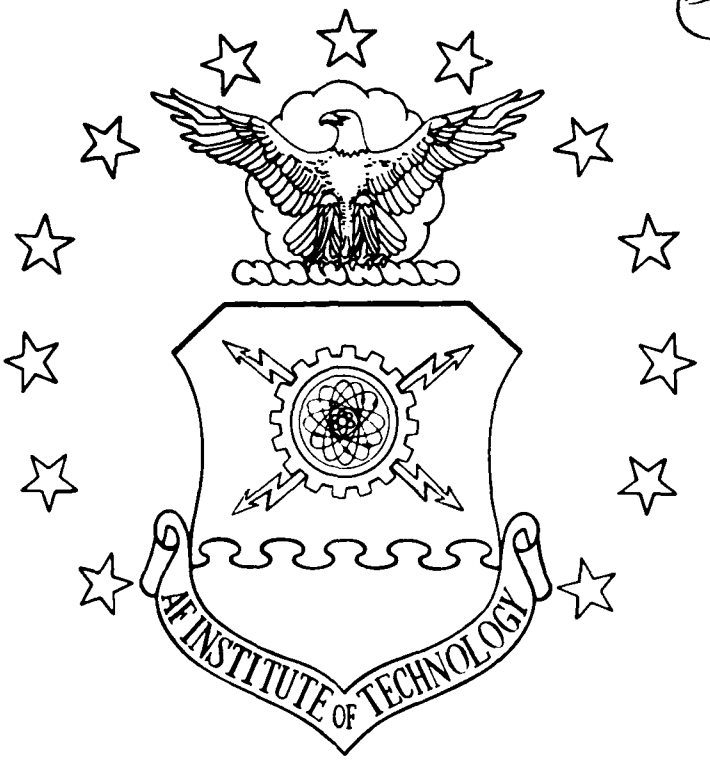

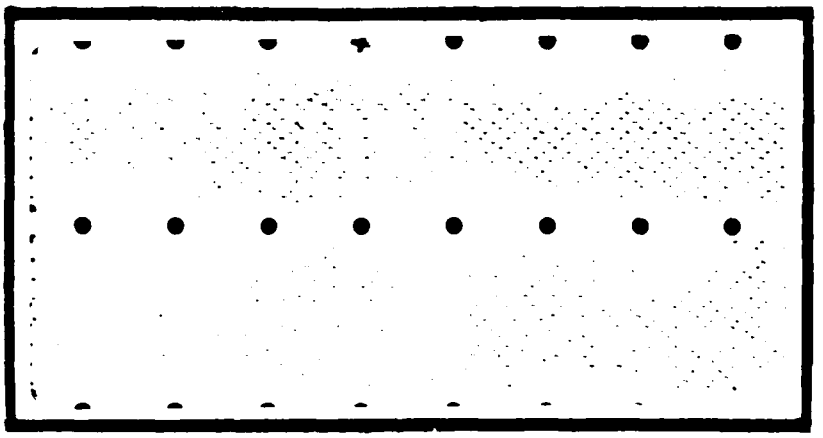

DEPARTMENT OF THE AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AFIT/GLM/LSM/85

AN ANALYSIS OF THE EFFECTS OF TEAM TRAINING BRANCH WAITING TIME ON THE ATTITUDES AND PERFORMANCE OF MISSILE MAINTENANCE TECHNICIANS (41131's)

THESIS

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AFIT/GLM/LSM/85S-18

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THESIS

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Gary J. Dorsey

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Abstract

This research examined the effect of excessive TTB initial technical training waiting time on Missile Maintenance Technician (41131) morale and proficiency. In performing this research, the Minuteman Missile maintenance environment was throughly examined. A literature review of several training and motivational theories, and their applicability to the Air Force training environment was also conducted.

The methodology developed for this research utilized Contingency Table analysis to test several categories of data at the .05 level of significance. These categories included Initial and First Year evaluation ratings by TTB waiting time, by initial technician assignment and by supervisor rank and experience. To gather data for these categories, Minuteman Missile Maintenance Technician (41 1X1) Initial and First Year Quality Control evaluation ratings were collected for a sample of 60 technicians. In addition, four telephone surveys were employed to gather data concerning TTB waiting periods, technician morale and utilization. These four surveys consisted of a technician sample survey and three supervisory population surveys.

The research findings indicate that excessive TTB waiting time (more than two months) in MMT prior to beginning TTB result in decreased morale and reduced proficiency on First Year evaluation ratings. These findings indicate that initial assignment of all 41131's to VECB is not only possible, but advisable, due to the decreased morale and proficiency that result from excessive waiting in MMT prior to beginning TTB initial technical training.

AN ANALYSIS OF THE EFFECTS OF TEAM TRAINING BRANCH WAITING TIME ON THE ATTITUDES AND PERFORMANCE OF MINUTEMAN MISSILE MAINTENANCE TECHNICIANS (41131's)

Chapter 1

Introduction

Purpose

The purpose of this research is to examine the utilization of newly assigned Missile Maintenance Technicians (41131's) to determine if there is any impact on technician morale and proficiency caused by excessive waiting between arrival from technical school and assignment to initial technical training in the Training Control Division's Team Training Branch. This research also examines the possibility of selectively placing newly arrived Missile Maintenance Technicians (41131's) within the Deputy Commander for Maintenance complex. This placement is designed to optimize their value by providing an efficient and effective assignment policy which utilizes these newly arrived 41131's within the maintenance complex until such time as they can be assimilated into Team Training Branch for the instruction necessary to become fully qualified Missile Maintenance Technicians.

Background

The cornerstone of United States national security policy is the deterrence of nuclear war. This fundamental objective requires that "the

United States have the capability to carry out a true, countervailing strategy" (6:2). According to Lawrence J. Korb, Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics, countervailance requires that "the United States should possess the capability to respond in such a way that the enemy can have no expectation of achieving any rational objective" (24:62). Korb also stated that the achievement of such a strategy requires the United States to have the proper strategic forces in

> numbers and quality so that they can survive a well-executed surprise attack, react with the timing needed to assure the necessary deliberations and control, penetrate any enemy defenses and destroy their intended targets (24:62).

This policy was also outlined by the current Secretary of Defense, Caspar Weinberger, in his Annual Report to the Congress. He stated that

> the United States will maintain a strategic nuclear force posture such that, in a crisis, the Soviets will have no incentive to initiate a nuclear attack on the United States or our allies. United States forces will be capable . . . to survive a Soviet first strike and retaliate in a way that permits the United States to achieve its objectives (50:17).

Weinberger went on to state that

> for the foreseeable future, our nuclear forces have to deter nuclear attack . . . , deter major conventional attack . . . , impose termination of a major war . . . and negate possible Soviet nuclear blackmail against the United States or our allies (50:18).

Building on the policy of our nation's political leaders, AFM 1-1,

Functions and Basic Doctrine of the United States, defines the Air Force mission in the following manner.

> The mission of the United States Air Force is to prepare our forces to fight to preserve the security and freedom of the people of the United States. Our goal is peace. To achieve this goal we must deter conflict by maintaining a force that is capable and ready (47:v).

To achieve our country's stated aim of national security policy, the United States developed a three-sided strategic capability. This capability, referred to as the Strategic Triad, consists of naval Sea-Launched Ballistic Missiles (SLBM's), Air Force long range nuclear bombers (B-52's), and Air Force land-based Intercontinental Ballistic Missiles (ICBM's) (45:25).

This third leg of the Strategic Triad (ICBM's) currently consists of 1000 Minuteman Missile Launch Facilities located in seven midwestern states (Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado and Missouri) and the Titan Missile system, currently undergoing deactivation. According to Gray, the important features of the ICBM force are that:

1. it is the most accurate means for striking promptly at time urgent targets.
2. it has uniquely reliable command, control and communications (C^3).
3. it is always "on station" (high operational readiness).
4. it can be threatened only by a very large strike against American soil.
5. it enjoys a pre-eminence of respect in Soviet eyes.
6. it provides cover, through attack-timing complications, for manned bomber/cruise missile carrier force.
7. it diversifies the threat faced by the Soviets.
8. and, the ICBM is the counterforce weapon par excellence (16:39).

To ensure the Minuteman and Titan missile systems meet the United States' stated objectives of deterrence, Intercontinental Ballistic Missiles must be kept at the highest state of readiness (39:1-1). This emphasis on readiness is a direct result of the ICBM's importance as a major component of our deterrent force (16:81).

The Strategic Air Command, as the command responsible for ensuring that ICBM's perform their deterrent role, has recognized the importance of maintenance in relation to readiness. This recognition is evident in SACR 66-12, Volume 1, Intercontinental Ballistic Missile Maintenance Management, Policy and Supervisory Responsibilities, which states that "All Intercontinental Ballistic Missile maintenance actions and all of management's efforts must be dedicated in support of the Single Integrated Operations Plan (SIOP)" (39:1-1).

This emphasis on maintaining maximum on-alert readiness requires the individual wings to perform maintenance efficiently and effectively when utilizing missile maintenance resources. According to Connell and Wallam, "Proper maintenance of the Minuteman Missile force is required in order to sustain a high alert rate" (8:1). In further recognition of this importance, the Strategic Air Command (SAC) has developed a Force Management Information System (FMIS) which tracks all ICBM off-alert (not mission ready) sorties on a real time basis (40:3-4).

The advanced age of the Minuteman Missile system has added to the problem of maintaining this system in the highest state of readiness. The first Minuteman Launch Facilities, constructed in 1961 at Malmstrom AFB, Montana, are now in their 24th year of service. The last Minuteman Launch Facilities constructed are in their 20th year of service (10). This record

of longevity is admirable given the originally projected service life of five to ten years (25:10). This longevity, however, has also created the requirement for increased Minuteman maintenance. As a result, it is imperative that all maintenance resources, especially personnel resources, be utilized efficiently and effectively in order to ensure that Minuteman continues as a survivable and reliable weapon system. To this end, SACR 66-12, Vol. 1, directs the Deputy Commander for Maintenance to "assure the optimum assignment of all maintenance personnel" (39:2-3), and to ensure that "training requirements are considered along with equal priority maintenance when allocating resources common to both" (39:2-3).

Problem Statement

Graduating Missile Maintenance Technicians (41131's) from the Air Training Command Center at Chanute AFB, Illinois, arrive at the individual Minuteman wings requiring initial technical training in Team Training Branch (TTB) prior to becoming fully qualified dispatching Missile Maintenance Technicians capable of correcting Minuteman Launch Facility discrepancies. The length of time spent awaiting this training results in an under-utilization of personnel since new arrivals wait several months before entering the Training Control Division's Team Training Branch initial technical training course required for Missile Mechanical Team members.

Justification

Historically, the uneven flow of Missile Maintenance Technicians from formal technical school training at Chanute AFB, Illinois, has created backlogs of Missile Mechanical Team Section personnel (41131's) awaiting

entry into TTB initial technical training. The resultant backlog forces the Missile Mechanical Branch to sub-optimize these personnel, using them for squadron details, as non-working observers on maintenance dispatches or as parts or equipment runners between the Strategic Missile Support Base and Minuteman Launch Facilities. These duties provide some measure of personnel utilization, however, it is far from optimal.

In addition to the lack of productivity inherent in carrying a new 41131 in Personnel Awaiting Training (PAT) status, it is highly probable that a new arrival's morale may be lowered as he/she waits several months to begin Missile Mechanical Team training. Also inherent in this situation is the lack of quick reinforcement of the basic skills learned at the Missile Maintenance Technician course at Chanute AFB. This course, three months in duration, coupled with up to several months delay in entering training and the two and one-half month TTB initial technical training course account for approximately one-fourth of an initial 48 month enlistment. With the Department of Defense interest in improving efficiency and effectiveness, it is imperative that individual missile wing maintenance complexes develop procedures which minimize this waiting period for entering TTB initial technical training, or more effectively utilize these personnel between arrival on-station and entry into initial technical training.

The HQ SAC Missile Maintenance Directorate has expressed significant concern over the time personnel are required to wait before beginning initial technical training. In August 1983, a monthly report, RSC number SAC-LGB(M) 8301, was initiated which requires all units to provide monthly data on individual missile wing maintenance personnel awaiting training and the number of these personnel that are awaiting training for more than 60

days. The data reproduced in Table I covers the period from September 1983 to August 1984, and provides historical information on the number of personnel required to wait for initial technical training for periods exceeding two months (38:1). As this data shows, during this one year period, 49.6 percent of all newly assigned Missile Mechanical Team Section 41131's were awaiting training over 60 days (38:2-8).

TABLE I
Monthly MMT Personnel (411X1's) Awaiting Training

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	TOT
less than 60 days	30	18	14	20	19	25	16	6	8	16	14	12	198
more than 60 days	26	20	20	19	23	16	26	19	8	4	8	6	195
% over 60 days	46	53	59	49	55	39	62	76	50	20	36	33	50%

note: "personnel awaiting training include those who are reasonably expected to enter TTB" (38:2)

Research Objectives

The primary objective of this research is to identify the attitudes and performance of 41131's who undergo this waiting period in order to determine if extensive waiting times have a measurable impact on motivation and proficiency. Since the HQ SAC report specifies less than or more than 60 days, this figure was determined to be significant for delineating excessive awaiting training time. To determine if extensive waiting times impact morale, 41131's and 41151's and their supervisors were interviewed regarding their feelings about having to wait to enter training. To measure

performance, initial TTB evaluation and first year technician evaluation ratings were obtained from wing Quality Control Divisions, and were then analyzed to determine if measureable impacts exist.

A second objective was to examine current wing technician assignment procedures to see if an assignment procedure could be utilized which would allow for an orderly progression into TTB initial technical training that would reduce personnel waiting time while effectively utilizing these personnel prior to starting TTB. In researching this objective the Minuteman Missile wing maintenance organizational structure was examined. This exploration was conducted through the use of interviews with wing personnel and through the use of the SAC Extended Unit Manpower Document (37). This document identifies all the 411X1 positions within the organization which might possibly utilize new accessions prior to their entry into TTB as Missile Mechanical Team members.

Research Questions

1. *Is 41131 morale decreased by delaying entry into Team Training Branch initial technical training?*

2. *What effect does waiting to enter Team Training Branch initial technical training have on Missile Maintenance Technician performance?*

3. *Can personnel be fully utilized in other maintenance branches beside Missile Mechanical Branch for initial duty in the 41131 career field?*

Scope

This research focused on the utilization of newly assigned 41131's by the individual Minuteman Missile Wings. It is designed specifically for the initial maintenance complex assignment of Missile Maintenance Technicians within the missile wing. The research considers alternative uses of these personnel within the different branches of the DCM complex. To answer the three research questions posed in the previous section, telephone interviews were conducted with four distinct groups of maintenance personnel. These personnel, located at the six Minuteman wings, consisted of a sample survey of 41131/41151's (Amn-Sgt) assigned to the Missile Mechanical Team Section, and three population surveys of Vehicle and Equipment Control Branch supervisors, Missile Mechanical Branch supervisors and Training Control Division supervisors (SSgt-Major). Additional data about 411X1 evaluation ratings was obtained from the six Quality Control Divisions. Air Training Command personnel at Chanute AFB, Illinois, and Strategic Air Command Headquarters at Offutt AFB, Nebraska were also contacted in the course of this research.

Chapter II

Minuteman Missile Maintenance

Overview

This chapter contains a specific description of the Minuteman Missile maintenance environment. In describing this environment, the chapter has been divided into three portions. The first portion describes the Minuteman Missile system, including wing location and type of weapon system employed. The second portion provides an overview of the Deputy Commander for Maintenance (DCM) complex. This complex, which consists of four divisions, Maintenance Support Division, Maintenance Control Division, Training Control Division, Quality Control Division and the two squadrons, the Field Missile Maintenance Squadron (FMMS) and the Organizational Missile Maintenance Squadron (OMMS), accounts for every 411X1 authorization on a Minuteman Missile base. The final portion of this chapter provides a complete account of all the authorized maintenance positions within the DCM complex, including a comprehensive breakdown of all authorized 411X1 positions.

Minuteman Missile System

The Minuteman Missile system consists of 1000 Missile Launch Facilities (LF's) and 100 Missile Launch Control Facilities (LCF's). These facilities are spread over six Minuteman Missile wings, located in eight mid-western states, and are required to remain on constant alert. Four hundred and fifty of these LF's contain single warhead Minuteman II missiles while

the remaining 550 LF's contain multiple warhead [illegible] missiles. These LF's and LCF's are organized into squadrons of [illegible] and [illegible] with one LCF maintaining primary control over 10 LF's. The location and type of weapon system employed at the six Minuteman wings is provided as Figure 1.

WING		LOCATION	MMII	MMIII
I	341 SMW	Malmstrom AFB, Mont	150	50
II	44 SMW	Ellsworth AFB, S Dak	150	
III	91 SMW	Minot AFB, N Dak		150
IV	351 SMW	Whiteman AFB, Mo	150	
V	90 SMW	F. E. Warren AFB, Wy		200
VI	321 SMW	Grand Forks AFB, N Dak		150

Figure 1. Minuteman Missile System

To maintain these missiles on alert, the Deputy Commander for Maintenance is assigned the responsibility to "plan, schedule, control, and direct the use of all maintenance resources to meet mission requirements" (39:2-1). He is further responsible for all "weapon system maintenance performed at Launch Facilities (LFs), Launch Control Facilities (LCFs) and on-base by individuals assigned to missile maintenance staff and production agencies" (39:2-1).

As previously stated in Chapter 1, the first Minuteman Launch Facilities were constructed in 1961 and are now nearing their twenty-fifth anniversary. This aging has resulted in a requirement for increased maintenance as subsystems, designed to support a projected life span of seven to ten years, begin to breakdown (7). To combat this aging, AFLC

through the Ogden ALC at Hill AFB, Utah, has initiated several major modifications designed to extend the life of the Minuteman system. Examples of these modifications include the Command, Control and Communications modification, the LF and LCF Brine Chiller modifications and the Ground Maintenance Status Response modification (20). These modifications have proven to be worthwhile additions to the Minuteman system. They have however, added to the wing DCM complex workload by increasing the maintenance workload required to support these modifications. Another major modification program, Project RIVIT MILE (Minuteman Life Extension), began in June 1985. This program is the first major forcewide Launch Facility and Launch Control Facility program undertaken by AFLC on the Minuteman system in support of the Minuteman Long Range Plan. Under this program, AFLC is integrating forcewide LF silo and LCF capsule modifications with several other programmed major modifications (7:3). The first three year cycle of this programmed nine year modification will integrate 53 major tasks (25:6-13) into an

> efficient deployment work package with detailed engineering: requirement analysis, drawings, site preparation procedures, inspection, repair and modification procedures, test and checkout procedures, SAC deposturing and reposturing procedures and supporting data (43:6).

The extent of this program will continue to tax the DCM workforce. This workforce, which consists of Missile Maintenance Officers (31XXG's), Electrical and Mechanical Engineering Officers (28XX's), Missile Systems Maintenance Technicians (411X0's), Missile Maintenance Technicians (411X1's) and Missile Facilities Technicians (411X2's) will all be affected by

the increased workload caused by this comprehensive maintenance program.

Deputy Commander for Maintenance Complex

"Under the tri-deputate system (Maintenance, Operations, and Resources) the DCM is the senior manager directly responsible to the Wing Commander for accomplishment of all base level maintenance" (21:1-2). To carry out this function, the DCM has at his disposal four divisions and two squadrons. The DCM staff is made up of the Maintenance Support Division, Maintenance Control Division, Training Control Division and the Quality Control Division. These divisions provide the support necessary to perform Minuteman Missile maintenance. The two squadrons, Field Missile Maintenance Squadron (FMMS) and the Organizational Missile Maintenance Squadron (OMMS) are responsible for performing all LF, LCF and on-base support equipment maintenance. Organizational charts for the DCM staff and the two maintenance squadrons are contained in Figures 2, 3, and 4.

Maintenance Support Division. The Maintenance Support Division consists of the Maintenance Administration, Maintenance Data, Maintenance Analysis, Maintenance Programs, and Technical Engineering Branches. This division provides a centralized administrative support section for the DCM complex. This division also provides long range planning for all areas of maintenance, advice and analysis on the management of logistics budgets, facilities, and manpower requirements. The Technical Engineering Branch provides "the expertise to resolve immediate weapon system deficiencies which are not within the scope of normal technical data and technician capability" (23:10).

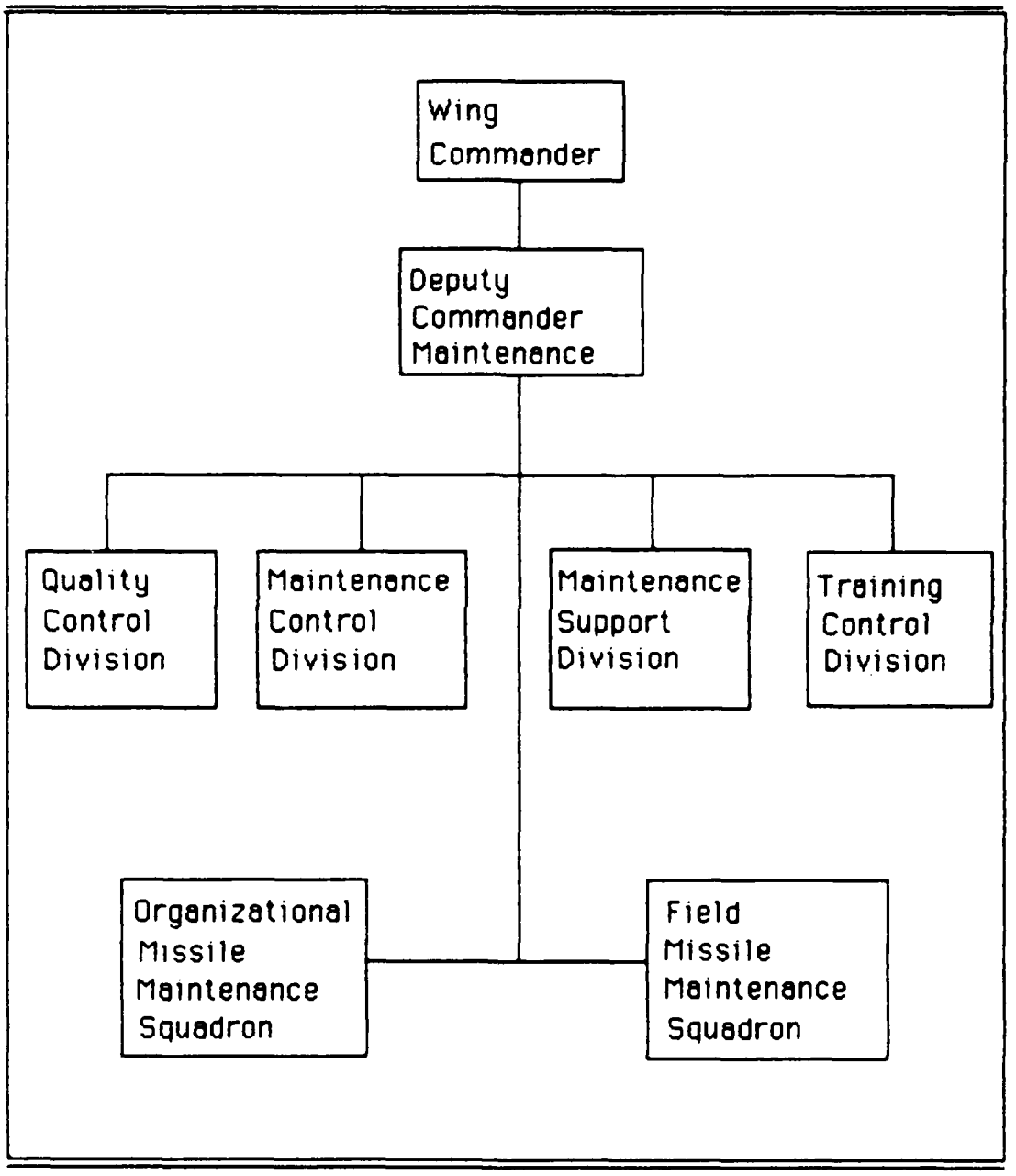

Figure 2. Minuteman Wing Maintenance Organizational Structure

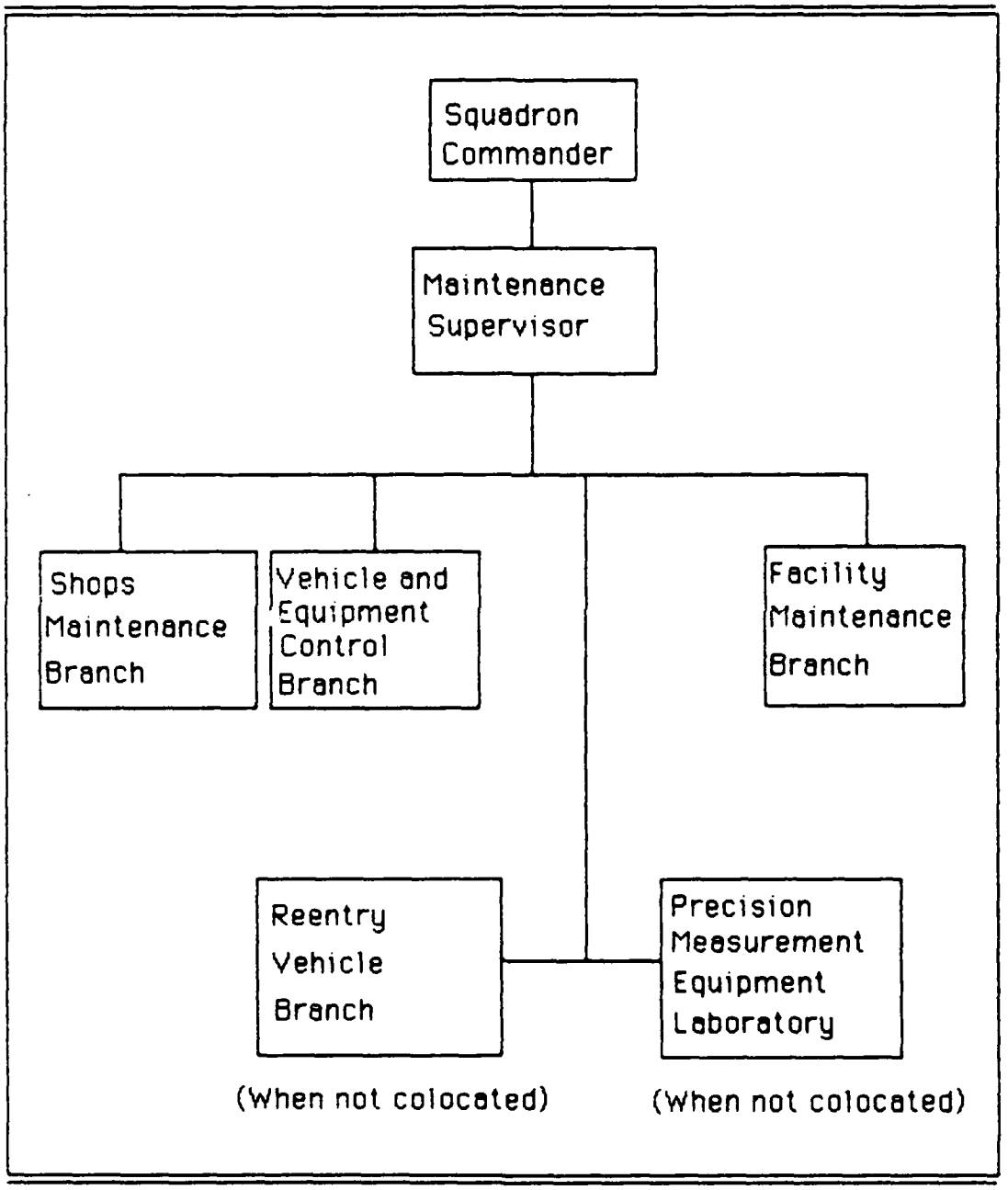

Figure 3. Field Missile Maintenance Squadron Structure

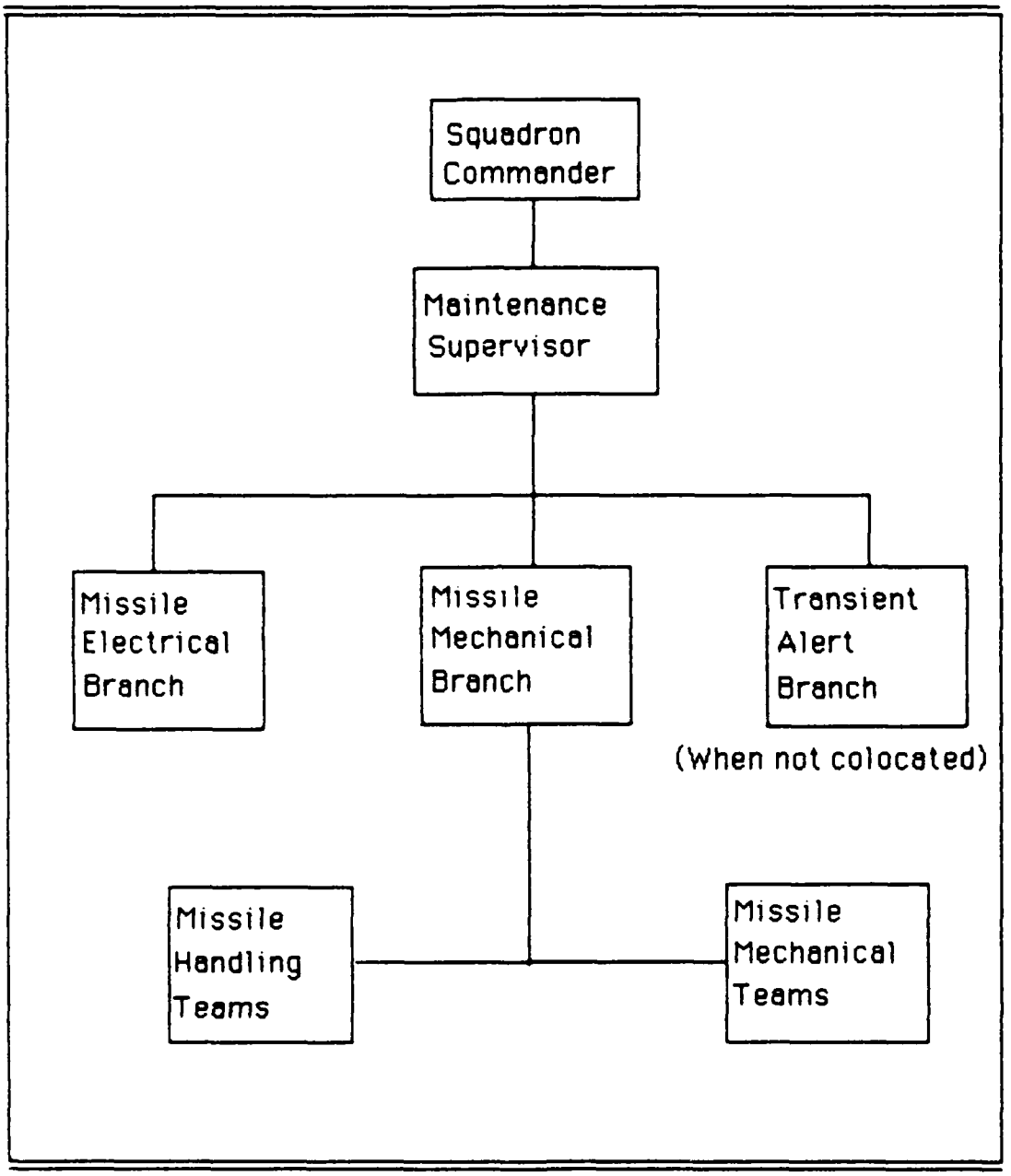

Figure 4. Organizational Missile Maintenance Squadron Structure

Maintenance Control Division. The Maintenance Control Division is responsible for

> directing the maintenance production activity, authorizing the expenditure of resources, and controlling the actions required to support the mission. . . . To accomplish these responsibilities, Maintenance Control is made up of the functional elements of Scheduling Control, Job Control, and Materiel Control (41:1-1).

Scheduling Control develops the daily, weekly, and monthly maintenance schedules. These schedules are developed by matching personnel, equipment and parts availability with known maintenance requirements based on the maintenance priority. Job Control is responsible for directing and controlling maintenance resources. It performs this function by monitoring all LF and LCF status, and by directing the actions of all dispatching maintenance teams. Materiel Control provides coordination between maintenance and supply when parts are required.

Training Control Division. The Training Control Division is divided into the Team Training Branch and the Training Management Branch. Training Control is responsible for centrally managing all DCM complex training requirements and

> schedules, monitors and controls all job qualification training, initial technical training, upgrade training, recurring training, management training, general training, and special technical training programs (23:16).

The Training Management Branch monitors, schedules, and controls the previously quoted training. Team Training Branch (TTB) provides technical maintenance task training for Missile Maintenance (MMT), Electro-

mechanical (EMT), Facility Maintenance (FMT) and Periodic Maintenance (PMT) Teams by forming trainee teams. These teams consist of 5 MMT members, 3 EMT members, 2 FMT members and 5 PMT members. To ensure students successfully complete TTB

> a master plan must be made for each trainee or team when assigned to TTB for initial technical training .... Training for teams/trainees must be programmed on a case by case basis as determined by the qualifications of trainees and actual tasks trained. Training may be programmed for less than, but must not exceed the following number or days: MMT-70 days, EMT-100 days, and FMT/PMT-110 days (41:4-1).

Quality Control Division. The Quality Control Division is designed to ensure an effective maintenance operation by "evaluating and inspecting personnel, procedures, equipment, facilities, and technical data" (42:1-1). Quality Control serves as the DCM advisory agency on technical matters and insures that maintenance personnel comply with all applicable technical and management procedures. This responsibility is performed through technical, activity, and special inspections and by implementation of the Maintenance Standardization and Evaluation Program (MSEP). As a result of MSEP all missile technicians

> who perform maintenance, administer task evaluations, or instruct technical tasks must be under MSEP. These technicians must be evaluated and receive at least a Qualified (Q) grade on the minimum number of tasks required on the Creditable Task Listing (CTL) to complete an initial/annual evaluation (23:22).

The grade criteria for these evaluations is shown in Table II.

TABLE II
Quality Control Grade Criteria (42:3-13)

RULE	A If individual committed	B and	C and	D award a grade of
1	no critical errors	no major errors	no minor errors	Highly Qualified (HQ)
2	no critical errors	no major errors	minor errors did not detract from outstanding performance	
3		one major error	no minor errors, or the accumulation of errors did not result in unacceptable performance	Qualified (Q)
4		no major errors		
5	one or more critical errors	N/A	N/A	Unqualified (UQ)
6	no critical errors	two major errors	N/A	
7		one major error	accumulation of minor errors caused unacceptable performance	
8		no major errors	excessive number of minor errors caused unacceptable performance	

Initial evaluations are conducted by Quality Control personnel upon completion of Team Training Branch initial technical training and First Year evaluations are conducted in the year following TTB. Highly Qualified (HQ), Qualified (Q), and Unqualified (UQ) ratings are assigned during both evaluations.

Missile Maintenance Squadrons. All DCM complex maintenance on missile LF's and LCF's is performed by maintenance teams assigned to the two maintenance squadrons, FMMS and OMMS. As a result, the majority of the enlisted personnel involved in maintenance production are assigned to the various squadron branches (37).

FMMS consists of the Shops Maintenance Branch, Facility Maintenance Branch, and the Vehicle and Equipment Control Branch. F. E. Warren, Whiteman and Malmstrom are single wing bases (not colocated with a bomb wing) and as such also have the Precision Measurement Equipment Laboratory (PMEL) and the Reentry Vehicle Branch assigned to FMMS. These branches are assigned to the aircraft wing at the other three missile bases.

The Shops Maintenance Branch is composed of the Mechanical Shop, the Power-Refrigeration-Electric Shop, and the Electronics Laboratory. These sections are responsible for the repair of support equipment, special purpose vehicle inspection and repair, and all on-base maintenance of electronic system components.

The Facility Maintenance Branch contains the Pneudraulics Shop, Facilities Maintenance Teams Section, Corrosion Control Section, and the Periodic Maintenance Teams Section. Individuals assigned to this branch maintain hydraulic and pneumatic systems, repair LF and LCF site support equipment and perform recurring periodic LF and LCF maintenance tasks.

The Vehicle and Equipment Control Branch (VECB) consists of the Vehicle Control Section and the Equipment Control Section. This branch

> provides serviceable vehicles and equipment for use in performing LF and LCF maintenance. . . . This branch is responsible for the assigned support equipment, general and special purpose vehicles, and for providing the maintenance teams with vehicles and the special tools and equipment to perform maintenance at Launch Facilities and Launch Control Facilities (23:29).

PMEL, whether under FMMS or the colocated bomb wing, provides maintenance, calibration, and certification of specified test equipment.

The Reentry Vehicle Branch, whether under FMMS or the colocated bomb wing, provides maintenance on all weapons and handling equipment.

OMMS consists of a Missile Mechanical Branch, a Missile Electrical Branch and, when not colocated with a bomb wing, a Transient Alert Branch.

The Missile Mechanical Branch (MMB) is responsible for handling of the missile, guidance and weapon and consists of a Missile Maintenance Team (MMT) Section and a Missile Handling Team (MHT) Section. The MMT Section is responsible for the

> removal and replacement of Reentry Vehicles, Re-entry System, Missile Guidance Sets, Propulsion System Rocket Engines, Penetration Aids, and jointly with MHT performs missile removal and emplacement actions (23:30).

The MHT Section is responsible for the "roll, transfer, transport, and jointly with MMT, removal and emplacement of missiles. They are also responsible for maintaining missile handling special purpose vehicle and equipment" (23:30).

The Missile Electrical Branch consists of Electro-mechanical Teams. These teams perform repair of electronic, electrical, surveillance, and access systems at all LF's and LCF's. At Ellsworth AFB, a Combat Targeting Team Section, responsible for aligning and targeting missiles, is also part of this branch.

The Transient Aircraft Branch, when not colocated, is responsible for the servicing and ground handling of transient aircraft.

Authorized Maintenance Positions

This portion of the chapter identifies the maintenance positions which comprise the DCM complex. The specific figures used in the remainder of the chapter come from the SAC Extended Unit Manpower Document (37). This document identifies all of the 411X0, 411X1, and 411X2 maintenance positions authorized at the six Minuteman wings. According to this document, there are 2434 authorized 411XX positions at the six wings. These positions are broken down by authorized skill level in Table III and by base and AFSC in Table IV.

TABLE III
Enlisted Authorizations by Skill Level

SKILL LEVEL	AUTHORIZATIONS
9	90
7	357
5	1078
3	909

TABLE IV
Enlisted Authorizations by Base and AFSC

	OVERALL	411X0	411X1	411X2	9 LEVELS
MALMSTROM	465	147	168	135	15
ELLSWORTH	395	137	141	102	15
MINOT	359	104	138	102	15
WHITEMAN	370	110	143	102	15
F.E. WARREN	436	134	160	127	15
GRAND FORKS	409	134	135	125	15
TOTALS	2434	766	885	693	90

For purposes of representation in the rest of this chapter, the maintenance complex manning authorizations for Minot AFB, North Dakota were utilized. Figure 5 reflects the maintenance AFSC's and number of authorized personnel by specialty code and by organization of assignment listed in the SAC Extended Unit Manpower Document for Minot AFB (37).

411X1 Technician Assignment

Since this research focused specifically on Missile Maintenance Technicians (411X1's), a more detailed breakdown of Minot's 411X1's by skill level and organization is provided in Table V (37). As this table depicts, Minot is currently authorized 138 Missile Maintenance Technicians. Of these, 18 are seven level, 61 are five level and 59 are three level positions. With almost 43 percent being three levels, the importance of obtaining maximum personnel utilization cannot be overstated.

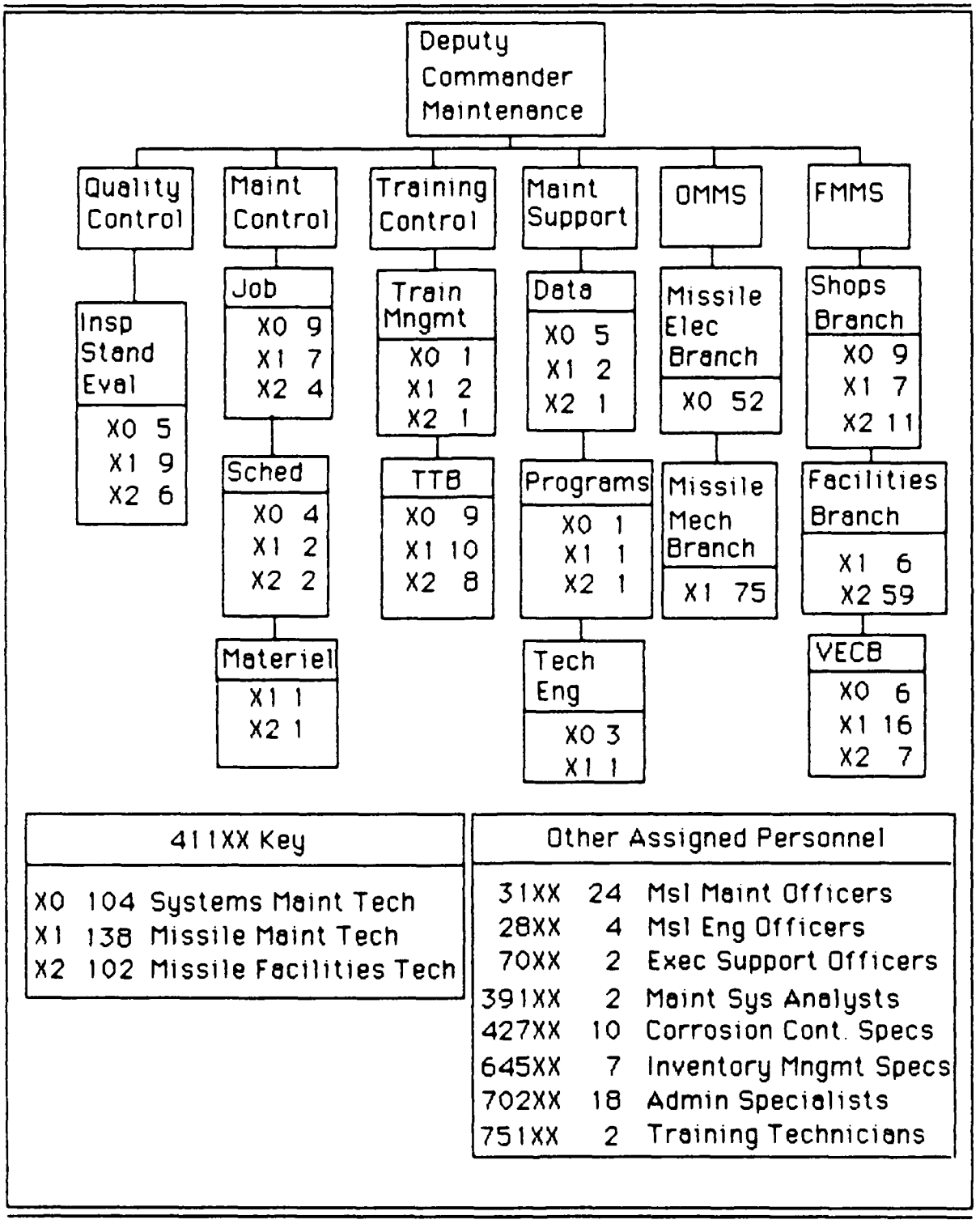

Figure 5. Maintenance Complex Authorizations

TABLE V

Maintenance Complex 411X1 Authorized/Assigned

DIVISION	BRANCH	7 LEVEL	5 LEVEL	3 LEVEL
MAINTENANCE SUPPORT	Maint Data	0/0	1/2	1/0
	Programs	0/0	1/1	0/0
MAINTENANCE CONTROL	Job	2/2	5/6	0/0
	Scheduling	1/1	1/1	0/0
	Materiel	0/0	1/0	0/0
TRAINING CONTROL	Training Mngmt	1/1	1/2	0/0
	Team Training	0/0	9/9	1/0
QUALITY CONTROL	Insp/Stand Eval	2/4	6/6	1/0
OMMS	MMT Section	6/7	20/17	30/29
	MHT Section	2/2	7/5	10/8
FMMS	Mech Shop	1/1	2/5	4/1
	Pneudraulics	1/2	2/4	3/2
	Vehicle Section	1/1	3/3	5/13
	Equipment Section	1/1	2/4	4/9
		18/22	61/65	59/62

This table also shows that, although three levels are authorized in staff positions, none are currently assigned to these positions at Minot. This lack of assignment is reflected forcewide and results from the necessity to have field qualified 411X1's in these positions since the intricacies of staff work require a detailed working knowledge of dispatching procedures and problem areas.

Of the nine branches or sections authorized 41131's, only the Vehicle Control and Equipment Control Sections of VECB are manned at greater than 100 percent, each having over 200 percent manning in 41131's. This reflects the fact that personnnel can become productive quickly since training in this branch is all OJT with the exception of the special purpose vehicle licencing required to operate 15-ton tractors, 5-ton trucks, A-16 cranes and 15K forklifts.

The two equipment repair sections in FMMS (Pneudraulics and Mechanical Shop) that are authorized 41131 personnel are also undermanned in three levels. This undermanning is indicative of the fact that the intricacies of repair require a detailed working knowledge of the equipment.

The two dispatching sections in OMMS that utilize 41131's are MHT and MMT. Since MHT utilizes a team structure that does not require initial technical training, new personnel are assigned to existing teams, it is able to productively utilize 41131's immediately upon assignment. MMT requires completion of initial technical training prior to becoming a fully qualified dispatching team member. This requires assigned personnel to wait until MMT can form a trainee team, consisting of a team chief (Sgt-TSgt) and four team members (Amn-Sgt), and TTB can provide the instructors required to train the team. These requirements result in an unknown amount of wait-

ing prior to beginning initial technical training.

Initial 41131 Wing Assignment

The supervisors of the six VECB's and MMB's were queried regarding the current policy of assigning new 41131's. Two wings assign new personnel directly to VECB for use as a manpower pool for later assignment to MMT. Two other wings send them directly to MMB and have them wait for TTB initial technical training or assign them to MHT if an opening exists. The remaining two wings assign personnel to either VECB or MMB depending on need. None of the six wings initially assign 41131's to any other organization beside the three listed unless problems occur with security clearances or medical profiles. All six wings stressed that these were not firm rules but just guidelines for general assignment of 41131's, organizational requirements are always the driving factor in assignment.

Summary

This chapter provided a comprehensive overview of the Minuteman Missile Maintenance Environment. It included information on wing locations and weapon systems and it outlined the responsibilities of the four divisions and two squadrons assigned to the DCM complex. It also provided additional in-depth information on the specific DCM complex AFSC's authorized, concluding with a specific delineation of the authorized and assigned manning figures for all 411X1 positions at a representative Minuteman Missile wing.

Chapter III

Literature Review

Overview

This chapter examines the literature in the area of training, motivation and job satisfaction and their relationship to 411X1 productivity and morale. The chapter begins by defining training and discusses the Air Force training environment, from basic training to initial technical training at the technicians permanent duty station. The second portion of this chapter discusses the relationship between training and learning theory, and also describes several popular motivation and job satisfaction theories. The chapter concludes with a detailed discussion of the Air Force applicability of these theories on training, motivation, and job satisfaction.

Training Defined

Virtually every person hired to perform a job is given some type of training prior to performing that job. In the years since the industrial revolution, training has become an integral part of an organization's work environment. The importance of training as a pre-requisite for improving worker productivity, effectiveness and performance has been examined by many of the foremost experts in the field of management. According to Johnson

> The organization itself is in constant flux .... It changes pace and direction under the impact of an ever-changing environment. New products, new

> processes; the expansion of technology; these and other factors combine to help or hinder an organization's ability to survive and grow. One key to this survival and growth is the efficiency of the work force. .... This calls for constant attention to the growth needs of each employee .... To meet these needs efficiently, many organizations augment on-the-job supervision with formal off-the-job training (22:2-12).

Blake and Mouton have also expressed these same thoughts. According to them, training has

> proved to have some inherent value in stimulating productivity, particularly among the newly employed .... The idea is that a worker who has been helped to learn the ropes quickly will become more productive in a shorter period of time, and the benefits from doing so are substantial. This is equally true not only for the new employees; it is equally true for the employee who shifts from one level of job complexity to another (5:3).

This research into worker training by management has resulted in a concept of training that can be defined in the following manner.

> Training is the planned activities on the part of an organization to increase the job knowledge and skills or to modify the attitudes and social behavior of it's members in ways consistent with the goals of the organization and the requirements of the job (26:251).

Since management wants workers to perform positively for the organization, virtually every major corporation has a detailed, specific training program designed to increase new employee efficiency and effectiveness. According to Lundy, "most progressive organizations realize that

proper investments in people can pay lucrative dividends by means of higher and more efficient productivity" (12:399).

The terms productivity, efficiency and effectiveness are commonly used when defining training. Productivity has been defined in several ways. Mali defines productivity as the

> measure of how well resources are brought together in organizations and utilized for accomplishing a set of results .... Productivity is reaching the highest level of performance with the least expenditure of resources .... Productivity is a combination of effectiveness and efficiency (28:7).

Hatry defined productivity more simply. He defined productivity as "the ratio of output to input for a particular activity" (17:28).

Efficiency and effectiveness have also been defined in several different ways. Becker and Newhauser defined efficiency as "the ratio of outputs (returns, benefits) to inputs (costs, efforts)" (3:20). Their definition is the exact definition used by Hatry to describe productivity. Peter Drucker has been quoted by Schoderbek as stating that "Efficiency is concerned with doing things right. Effectiveness is doing the right things" (35:230). Mott defined effectiveness more specifically. He defined it as "the ability of an organization to mobilize it's centers of power for action, production and adaptability" (32:17). Since training is usually defined using these three terms it is readily apparent that training can have several definitions. For purposes of this research effort, the literature review on training was limited to the general definition of training that was provided earlier in this section.

Air Force Training

> The Air Force is composed of four basic elements: people; weapon systems; the facilities necessary for us to function and accomplish our roles and missions; and the organizational structure necessary to sustain the people, systems, and facilities. These elements are integrated to form a military force. The most important element of the aerospace force is people (47:3-5).

In recognition of the importance of people and the importance of training, the Air Force has developed programs which encompass the entire spectrum of training. This training includes military training, technical training, and professional military education (R:4-10). The importance of this training can not be understated since, according to Johnson

> When there is a gap between actual performance and the standard, productivity suffers. Training can reduce if not eliminate this gap. It does so by changing the behavior of individuals by giving them whatever additional specific items of knowledge, skills, or attitudes they need to perform up to that standard (22:2-1).

Air Training Command (ATC) Training

The Air Training Command provides most of the aforementioned training. The typical Air Force recruit's first six weeks are spent in ATC Basic Military Training at Lackland AFB, Texas. This training exposes the new recruit to the Air Force military environment, and is "divided into four main parts: in-processing, military training, academic training and evaluation" (46:26). This training provides the transition from civilian to military

life that is necessary if the new recruit is to be successful in the military environment.

After successfully completing Basic Military Training, the new recruit is reassigned to a permanent duty station or to a technical school at one of several Air Training Command Technical Centers. This technical training, which can last from one week to over a year, exposes new Air Force members to their career field. As a result, most courses are generalized, due primarily to different weapon systems utilizing the same technical specialties, and they do not attempt to make students totally proficient prior to their initial permanent duty assignment.

Successful completion of a technical school results in the award of a three skill level (apprentice). Hiatt and Nunnery defined the Air Force skill level as "the degree of competence an individual has achieved with respect to the duties and responsibilities associated with an occupation or specialty" (18:10). The Air Force identifies an airman's skill level in the fourth digit of his/her AFSC. As an example, a new Missile Maintenance Technician who completes technical school receives an AFSC of 41131. Five and seven levels are awarded based on a combination of Career Development Course completion, supervisor recommendation for upgrade, time in grade and Squadron Commander's approval.

Air Force Training Requirements

Ongoing organizations must compensate for employee turnover and ensure that enough trained personnel will be available to perform the mission. The Air Force is not immune from this problem. Personnel leave the Air Force in any number of ways: separation after a full enlistment; discharge

for medical, punitive or hardship reasons; or in some cases, death.

The Air Force Manpower and Personnel Center (AFMPC) at Randolph AFB, Texas must contend with this attrition when deciding how many new personnel will be required to replace departing Air Force members. To ensure adequate numbers are available in each career field, AFMPC hosts an annual Training Personnel Review Conference, usually held in March of each year, which brings together training personnel from ATC and the utilizing commands. Air Force manpower attrition rates, training washout rates and all other requirements are considered before a personnel requirements master plan is developed (2).

Once quota's are determined, Air Training Command sets up class dates for the projected personnel training requirements. The Air Force Recruiting Service is then advised of the number of available slots and start dates of the different technical schools.

41131 ATC Technical Training

New Missile Maintenance Technicians begin their technical training at Chanute AFB, Illinois in one of two courses. These thirteen week courses, ATC course C3ABR41131A 000 or C3ABR41131A 001 (depending on the Minuteman series a technician will eventually work on), are group paced with an average class consisting of eight students (51). The number of yearly classes depends on the Training Personnel Review Conference. The current washout rate is three percent for MM III and five percent for MM II (51).

As previously discussed, these two courses are designed to be group paced and are used to train airmen to perform duties as Missile Maintenance Technicians, AFSC 41131. The specific training program includes

> operation and maintenance of hydraulic, pneumatic, electric and mechanic systems; principles of solid propulsion system and inertial guidance systems. .... Removal and installation of missile safing pins and ordnance initiating devices, operation and maintenance of transportation and support vehicles ... transportation of missiles to remote launching sites, emplacement and leveling the missile in underground launch facilities .... emergency procedures for the protection of personnel and equipment; use of technical publications, maintenance forms and tools; corrosion, security, safety, maintenance management, vehicle and equipment control (48:i)

Upon successful completion of technical school, 41131's are assigned to a permanent duty station. Graduates of course C3ABR41131A 000 are assigned to Minuteman II wings and graduates of course 001 are assigned to Minuteman III wings using the following method.

The master personnel computer at Randolph AFB, Texas scans 411X1 wing manning and tentatively assigns technicians based on need (lowest percentage of assigned versus authorized). Since other factors may also be involved, such as an upcoming modification or an excessive number of personnel awaiting training, these tentative assignments are made available to HQ SAC/LGBA for review. This procedure serves to balance the flow of new 41131's to the Minuteman Missile wings (2).

Missile Wing Training

After completing ATC technical training, every new Missile Maintenance Technician arriving at a Minuteman Missile wing receives additional ancillary training before beginning 41131 duties. This ancillary training consists of instruction in several varied areas and includes such things as

driver's training, missile safety, nuclear safety, small arms qualification, and codes certification (41).

In addition, every new 41131 is automatically entered into upgrade training which requires the technician to complete a correspondence career development course (41151) in preparation for upgrade from Missile Maintenance Apprentice to Missile Maintenance Specialist.

Depending on branch assignment, technicians may undergo additional TTB technical training. Most branches authorized 41131's train their personnel using OJT which allows a technician to begin work immediately. However, technician's assigned to the Missile Maintenance Team Section are required to attend TTB initial technical training before performing Minuteman Missile Launch Facility maintenance (39:1-3).

Because TTB can usually accomodate only one trainee team at a time, consisting of a team chief and four team members, excessive or inadequate numbers of personnel awaiting training can result in an extended wait to enter training since personnel arriving after a team starts TTB training will usually have to wait for that team to finish prior to their being able to start.

Learning Theory of Training

Missile Maintenance Technicians may spend almost a full year before becoming fully qualified dispatching MMT team members. How technicians spend this time in training, or awaiting training, is critical to their success as 411X1's since learning during this period carries over into the remainder of their Air Force career. This learning is "generally considered by psychologists to be any change in an individuals response or behavior resulting from practice or experience" (12:399). "Efficient training means efficient

learning, retention, and transfer on the part of the trainee" (26:263). To be efficient, Eckles lists five accepted principles of learning that should be considered when conducting training. These principles are

1. Motivation- the student or trainee must want to learn.
2. Conceptualization- until the trainee understands the whole story he will remain in a state of confusion.
3. Practice- the sooner the trainee can be involved in a job, the sooner he will be able to fully cope with it.
4. Reinforcement- the trainee must receive some encouragement or reward.
5. Feedback- the trainee must know how close his achievement is to the desired standard (12:402).

Landy and Trumbo listed seven accepted principles of learning which should be considered by management when developing a training program. Their list, which is more inclusive than Eckles, contains the same five concepts and adds two others. Their list and definitions are as follows

1. Motivation- to learn one must want to learn.
2. Whole vs Part Learning- depending on task you either practice subtasks or component tasks and then integrate them or practice whole task from the beginning.
3. Practice- repetition and active involvement in training.
4. Reinforcement- reward for successful completion.
5. Feedback- conditions in a performance situation that inform the subject about performance and progress.
6. Distributed or Spaced Learning Periods- spacing of training, length of, and intervals between training.
7. Transfer of Training- using knowledge, skills and attitudes acquired in training (26:264).

It is extremely important that Air Force trainers consider these principles of learning to ensure that trainees are provided with the best learning environment possible. This is especially true since Air Force

training differs substantially from civilian training. In addition, Air Force training is usually performed at several locations resulting in spaced learning periods, while civilian training is generally performed at a single location.

The missile maintenance environment, especially for 41131's who undergo initial technical training, has the potential to violate many of these principles. The practice of having 41131's wait for TTB initial technical training is a necessary violation of the principles of learning. This violation occurs since personnel awaiting training cannot practice the skills learned in technical school, they cannot immediately transfer the knowledge, skills and attitudes acquired in their technical training course at Chanute, and they cannot get the reinforcement necessary to maintain motivation.

Theories of Motivation

There are many philosophical approaches that attempt to describe why and how workers are motivated. The rational-economic man approach "assumes that people are solely motivated by economic considerations and can make rational economic decisions" (4:377). A second approach, social man, gained acceptance in the early 1900's as a result of the Hawthorne experiments. This view states that "workers may be more responsive to their peers than to their company" (4:378). A third approach, self-actualizing man, assumes that "man is intrinsically motivated . . . . He takes pride in his work because it is his work" (52:510). A fourth philosophy, McGregor's Theory X and Theory Y, is summarized by DuBrin as follows:

> Theory X assumes that people dislike work and must be coerced, controlled and directed toward organizational goals. Furthermore, most people prefer to be treated this way so they can avoid responsibility.

> Theory Y, the integration of goals, emphasizes the people's intrinsic interest in their work, their desire to be self-directing and to seek responsibility, and their capacity to be creative in solving problems (11:39).

These philosophies are necessarily quite broad. However, they serve as the basic philosophies from which the following four detailed job behavior theories emanated. These theories are Herzberg's Two-Factor Theory, Maslow's Hierarchy of Needs Theory, Vroom's Valence-Expectancy-Instrumentality Theory and Equity Theory.

Herzberg's Two-Factor Theory. This motivational theory was developed by Frederick Herzberg in the late 1950's. His research centered on isolating factors that contributed to job satisfaction, job dissatisfaction and levels of job performance. He divided these factors into motivating factors and hygiene factors (14:158). Figure 6 provides a detailed breakdown of these motivators and hygiene factors.

MOTIVATORS/SATISFIERS (INTERNAL TO THE JOB)	HYGIENE/DISSATISFIERS (EXTERNAL TO THE JOB)
RECOGNITION	SALARY
RESPONSIBILITY	STATUS
PRESTIGE	SUPERVISION
STIMULATION	WORKING CONDITIONS
ADVANCEMENT	JOB SECURITY
ACHIEVEMENT	COMPANY POLICY AND ADMIN.

Figure 6. Herzberg's Two-Factor Theory

According to Herzberg's theory, the

> hygiene factors can usually only dissatisfy if they are not present in sufficient amounts. At least, they can bring an individual to a neutral point (no job dissatisfaction) where the motivating factors can provide job satisfaction and increased motivation (14:158).

Herzberg's theory has been attacked on several grounds. House and Wigdor summarized the findings of several research efforts and were quoted by Francis and Milbourn. This research was summarized by House and Wigdor as follows.

1. A given job factor can cause job satisfaction for one person and job dissatisfaction for another. Factors partially determining whether a factor will be a source of satisfaction or dissatisfaction include: job level, age, education, sex and culture.
2. A given factor can cause job satisfaction and job dissatisfaction in the same sample of workers.
3. Intrinsic or motivational factors are more important to both satisfying and dissatisfying job events.
4. The Herzberg theory is an over simplification of the relationship between motivation and satisfaction, and the sources of job satisfaction and job dissatisfaction (14:158-159).

Maslow's Hierarchy of Needs. Another major theory in the area of motivation was developed by Abraham Maslow. This Need Fullfillment Theory contends that a person's behavior is driven by a set of unsatisfied needs hierarchical in nature. This five tiered hierarchy is given in Figure 7 (14:10,147).

LEVEL	NEED	EXAMPLES
5	SELF ACTUALIZATION	fulfilling one's potential
4	ESTEEM AND STATUS	self-respect, recognition
3	BELONGING AND SOCIAL	friendships, group memberships
2	SAFETY AND SECURITY	shelter, economic security
1	PHYSIOLOGICAL	food, air, water

Figure 7. Maslow's Hierarchy of Needs

According to this theory, a person strives to fill his biological needs before striving to meet his psychological needs. In other words, "needs are arranged in a hierarchy of prepotency, meaning as a person fulfills a lower need the next higher need becomes important in directing the persons behavior" (14:147).

Several recent research studies have been completed which contradict this theory. One study found "there was a tendency for need satisfaction to be positively correlated with need importance" (14:147). Another study in 1972, found little support for the theory that needs exist in a multi-level hierarchy and proposed a "simple two-level hierarchy consisting of the physiological needs on one level and all other needs in no particular order on the other" (14:148). However, a more recent study in 1976, by Mitchell and Moudgill, supports the existence of Maslow's needs categories. They discovered that test participants had the following categories of needs: safety, social, esteem, autonomy and self-actualization (31).

Vroom's Valence-Expectancy-Instrumentality Theory. This theory proposed by Victor Vroom in 1964, states that motivation is the product of expectancy, instrumentality, and valence. Expectancy in this theo refers to a person's individual perception of the amount of effort required to perform an action. Instrumentality is the relationship between an action and the outcome or result of that action. Valence refers to the importance of an outcome to a person (14).

The Vroom theory of job satisfaction agrees with both the Maslow and Herzberg theories, since, according to Horne

> unsatisfied needs stimulate behavior and satisfied needs do not. Satisfied needs activate unsatisfied needs thus creating another valence relationship and anticipated need satisfaction (19:19).

Equity Theory. Equity theory revolves around an employee's perception of the relationship between the amount of effort the employee expends and the rewards they attain. According to this theory, "if the ratios of effort (input) to return (outcome) are about the same, the individual is satisfied" (4:383).

Dissatisfaction results from several situations. Lawler outlined these situations as follows:

1. People with high perceived inputs will be more dissatisfied with a given facet than people with low perceived inputs.
2. People who perceived their job to be demanding will be more dissatisfied with a given facet than people who perceive their jobs as undemanding.
3. People who perceive similar others as having a more

favorable input-output balance will be more dissatisfied with a given facet than people who perceive their own balance as similar to or better than that of others.

4. People who receive a low outcome level will be more dissatisfied than those who receive a high outcome level.
5. The more outcomes a person perceives his comparison other to receive, the more dissatisfied he will be with his own outcomes. This should be particularly true when the comparison other is seen to hold a job that demands the same or fewer inputs (27:77).

This theory is also not without it's critics. At least one study found that problems with equity theory research occur in the industrial setting because pay is not the only outcome, subjectivity and utility also influence the perceived outcome and "the adequacy of the reference person that an individual compares him- or herself with is not always clear" (15:117).

Regardless of which of the four theories are employed, missile maintenance managers must be concerned with ensuring that the 41131's who are awaiting training are provided with an environment and work which will enable them to feel productive and part of the organization.

Job Satisfaction

Job satisfaction is also important to motivation. According to Francis and Milbourn, "Job satisfaction refers to an emotion or feeling that an employee has toward the entire work situation" (14:75). They also stated that Rowan reviewed "the empirical literature and determined job satisfaction has, as a minimum, seven important facets" (GG:75). The seven facets were "the work itself, supervision, promotional opportunities, the organization and it's management, pay and other financial benefits,

co-workers, and working conditions" (14:75). Francis and Milbourn also stated that another study, by Smith, Kendell and Hulin, found five important facets. These five facets were exactly the same as five of the seven found by Rowan. They were: "the work itself, pay, promotional opportunities, supervision, and co-workers" (14:75).

Air Force Applicability

These job behavioral theories can have a great impact on the morale and performance of 41131's. Missile Maintenance supervisors can go a long way toward maintaining 41131's interest in their jobs by adhering to the points made by these behavioral theorists. Although they differ in certain respects, the main points are identical. Herzberg's motivators, which he stressed as the theory's most important aspect, indicate that recognition, responsibility, stimulation and achievement can significantly increase job satisfaction and motivation. Maslow's hierarchy indicates that after reaching level three, (the Air Force environment provides for the first two levels), recognition, self-respect and fulfilling potential become motivators. Vroom's Valence-Expectancy-Instrumentality Theory agrees with Herzberg and Maslow regarding the importance of satisfying needs (19:19). The job satisfaction theories espoused by Rowan, and by Smith, Kendall and Hulin, stress the work itself as being the key ingredient to job satisfaction (14:75).

It is contingent upon supervisors to provide these new 41131's with challenging rewarding work to maintain motivation and job satisfaction. Recognition, responsibility, stimulation and achievment must be made part of the every day work environment. This can occur by placing new technicians in positions that do not require TTB, such as VECB, to immediately

utilize their work skills, or by providing the technicians awaiting training in MMT with a varied and challenging pre-TTB work environment which utilizes their skills and talents. In either case, technicians must be made to feel that they contribute to the organization and that they are being utilized to the maximum practical extent to ensure that high motivation and job satisfaction are maintained prior to beginning initial technical training.

Summary

This chapter examined the literature in the area of training, learning theory, motivation and job satisfaction in relation to the Air Force training of Missile Maintenance Technicians. It examined the decentralized training provided to these Missile Maintenance Technicians and discussed the increased importance of the principles of learning in ensuring that Missile Maintenance Technician morale and proficiency do not suffer as a result of the waiting time encountered between arrival at a missile wing and beginning TTB initial technical training.

Chapter IV

Methodology

Overview

This chapter outlines the methodology employed to answer the three Research Questions posed in Chapter 1. In developing the methodology, the chapter is broken down into four sections. The first section contains the research plan and procedure for gathering the data necessary to answer the these questions. The second section describes the sample and populations surveyed during this research. The third section describes the data collection plan, provides a detailed discussion of the types of survey questions, survey construction and validation, and the additional data that was utilized in performing this research. The final section deals with the data analysis plan utilized to answer the three Research Questions.

Research Plan

To determine if extended waiting to enter TTB causes reduced morale and less proficient 411X1's, data was collected through telephone interviews with 411X1's assigned to the MMT Section, Missile Mechanical Branch supervisors, Training Control Division supervisors, and Vehicle and Equipment Control Branch supervisors from the six missile wings. These supervisors were either 411X1's, or direct supervisors of 411X1's, and are all currently involved in the direct performance or support of missile maintenance. These personnel were queried on their perception of 41131 utilization prior

to TTB initial technical training. They were also asked whether 41131's could be utilized more effectively in another capacity prior to beginning initial technical training, and whether extended TTB waiting time created deliterious effects on morale and performance. This information was then analyzed to see if there was any degree of consensus among the different groups regarding the questions posed in the telephone interviews.

In conjunction with the telephone interviews, data on Missile Maintenance Technician Quality Control evaluations was also collected. The six Quality Control Divisions provided Initial and First Year evaluation data on a sample of ten 411X1's at each base.

Sampling Plan

Four separate telephone interview surveys are employed in collecting the data utilized in this research. The first survey (Appendix A), was designed to sample 60 411X1's, ten from each MMT Section. The second survey (Appendix B), was administered to a population of twelve, the Missile Mechanical Branch OIC's and NCOIC's at the six wings. The third survey (Appendix C), was administered to a population of twelve, the six wing Vehicle and Equipment Control Branch OIC's and NCOIC's. The final survey (Appendix D) was also administered to a population of twelve, consisting of the six wing Training Control Division NCOIC's and TTB/MMT Branch NCOIC's.

The sample and populations chosen for the four telephone interview surveys include personnel from all of the organizations which might possibly utilize 41131's. All supervisory personnel are intimately familiar with the management of 411X1's and the enlisted supervisors all go through the TTB initial technical training process.

A breakdown of all personnel contacted during the four interview surveys is provided in Table VI. This table provides the total number of personnel interviewed by Air Force Specialty Code (AFSC) and organization.

TABLE VI
Survey Representation

ORGANIZATION	411X1 TECHNICIANS	411X1 SUPERVISORS	3124 SUPERVISORS
MISSILE MECHANICAL BRANCH	60	6	6
VEH AND EQUIP CONTROL BRANCH	0	6	6
TRAINING CONTROL DIVISION	0	12	0

Enlisted Personnel (41131/41151) Interview Sample. This telephone interview sample survey was taken from a population of all first term airmen currently assigned to the six Minuteman Missile wing Missile Mechanical Team Sections. These airmen were selected based on telephone availability and were asked to respond to the questions listed in Appendix A. These 60 personnel represent 20 percent of the 299 MMT 41131/51 authorizations and include personnel who have completed TTB and personnel who are currently awaiting TTB training. Because graduates of TTB dispatch to the missile field, the number of personnel available for interviews is extremely limited. As a result, every effort was made to interview on ancillary training days, when greater technician availability was anticipated. Because this method of technician selection is not completely random, it was

felt necessary to ensure that no more than two members of any one dispatching team were interviewed in order to minimize bias or potential skewing of the data which might result from one team providing a disproportionate share of the responses.

Missile Mechanical Branch OIC/NCOIC Interview Population. A census of the population of the six Minuteman Missile wing Mechanical Branch OIC's and NCOIC's was conducted using a telephone interview survey. The officers interviewed are all fully qualified Missile Maintenance Officers (3124's), and the NCOIC's are all 41171's who are thoroughly proficient in the career field, having personally undergone TTB initial technical training during their missile maintenance careers. These personnel were chosen because of the detailed information they could provide as a result of regular interaction with the Missile Maintenance Technicians interviewed in the enlisted personnel telephone survey. It was felt that, as the supervisors directly responsible for personnel awaiting training, they could contribute immensely to questions concerning morale and personnel utilization prior to TTB entry.

Vehicle and Equipment Control Branch OIC/NCOIC Interview Population. A census of the population of the six Minuteman Missile wing Vehicle and Equipment Branch OIC's and NCOIC's was also conducted using a telephone interview survey. The officers interviewed are all fully qualified Missile Maintenance Officers (3124G's), and the NCOIC's are all 41171's. As the only other branch, besides MMB, capable of assimilating large numbers of 41131's into it's daily operation, it was felt that the perception of these twelve people would be of great assistance in gaining an insight into the possible advantages or disadvantages of assigning new 41131's to VECB prior

to reassigning them to MMT for TTB initial technical training as dispatching 411X1's.

Training Control Division NCOIC and TTB/MMT Branch NCOIC Interview Population. A final census was conducted with the population of the six Minuteman Missile wing Team Training Division NCOIC's and TTB/MMT Branch NCOIC's using a telephone interview survey. These branch NCOIC's, who carry 41171 AFSC's, are selected to fill this position based on the proficiency and professionalism they exhibited while performing as dispatching MMT team chiefs (41:4-2). The division NCOIC's are extremely experienced Minuteman Missile maintenance personnel, having held several supervisory positions within the Deputy Commander for Maintenance complex. As a result, these NCOIC's, who offer a wealth of Minuteman Missile maintenance experience, and the TTB/MMT NCOIC's, who are ultimately responsible for training 411X1's, were felt to be the most qualified personnel in the training arena to answer questions pertaining to trainee motivation and job knowledge.

Data Collection Plan

In obtaining data from the members of the four different samples, a structured interview approach was utilized (see appendices A-D). These interviews were performed by telephone and consisted of several standardized questions and one open-ended question. These structured interview questions included a combination of biographical information and questions requiring yes/no answers (nominal data).

The telephone interview approach was selected over the questionnaire approach due to the limited number of Minuteman Missile maintenance person-

nel available for three of the four surveys. The small number of possible respondents made it necessary to obtain a 100 percent response rate to assure meaningful results.

The actual interview itself began with the structured portion of the interview. The structured interview method was utilized as a means of standardizing the responses over all four surveys. This portion of the interview developed the demographics of the interviewees and established their expertise in the area of Minuteman Missile maintenance. The interviews were concluded with an open-ended question. This question was designed to allow the interviewee to respond to a broad question related to the effects of long TTB waiting time in three of the surveys and to respond to a broad question regarding the merits of 100 percent assignment of new 41131's to VECB in the fourth survey. The open ended questions were used to reduce the effect of any unintentional bias which may have been built into the interview questions by the researcher. It was felt that the use of both structured and open ended questions improved the value of the survey method utilized in this research. According to Selltiz

> the purpose of providing the interview with structure is to ensure that all people interviewed respond to the questions the researcher wishes to have answered: however, the formulative and discovery functions of the experience survey require that the interview always allows the respondent to raise issues and questions the investigator has not previously considered (36:57).

Prior to performing the telephone interviews, the interview approach was reviewed by an Air Force Institute of Technology, School of Systems and Logistics (AFIT/LSH) faculty member, Doctor Robert Weaver, for bias,

question structure, applicability and relevance of question selection (49). These surveys were also discussed with a member of the HQ SAC Missile Maintenance Directorate (LGB), Lieutenant Colonel William Cooper (9). This was accomplished to further test for question clarity and adequacy and also to gain a feel for the amount of time respondents would need to adequately respond to the surveys. The concern over interview time led to the decision to use a small number of questions since research has shown that excessive length tends to distort the responses. According to Emory, "ten minutes or so has generally been thought of as the practical maximum" (13:307).

It was also necessary to obtain additional data regarding the performance of TTB graduates to determine if waiting time affected proficiency. This was accomplished by compiling a list of ten 411X1's TTB graduates (this list did not include team chiefs) and the amount of time they waited prior to entering TTB training. These personnel were randomly selected from Quality Control rosters by selecting the second and third members of the first five MMT teams listed. If a 411X1 did not have the required number of evaluations, seven creditable grades, then members of the sixth and seventh teams were used. No more than two members of the same team were to be utilized since team members are evaluated on the same day, and evaluator bias, or "halo effect", had the potential to skew the research data.

To obtain the necessary data, the Quality Control Division's were queried regarding the Initial post-TTB training creditable evaluations and the First Year creditable evaluation ratings on each of the ten graduates. These creditable evaluations provided three Initial, Highly Qualified (HQ), Qualified (Q), or Unqualified (UQ) ratings, and four First Year evaluations ratings. These creditable evaluation ratings were analyzed to determine if a relation-

ship existed between waiting time and evaulation ratings.

Data Analysis Plan

This section outlines the statistical methods and techniques that will be used to analyze the information described in the data collection plan.

Research Question 1, *Is 41131 morale decreased by delaying entry into Team Training Branch initial technical training?* , will be answered by evaluating and comparing the perceptions of 411X1's with Missile Mechanical Branch, Vehicle and Equipment Control Branch and Training Control Division supervisors. The questions in each of the telephone surveys designed to answer Research Question 1 are shown in Table VII.

TABLE VII
Survey Questions/Responses Designed to Measure 411X1 Morale

	APPLICABLE SURVEY QUESTION			
RESEARCH QUESTION	411X1 TECHNICIAN	MMT OIC/NCOIC	VECB OIC/NCOIC	TCD NCOIC, TTB NCOIC
1	3,4,5,6	2,3	3	1
high morale responses	Y,N,N,N	Y,N	N	Y

The percentage of high morale responses for each survey question identified in Table VII will be shown in bar graph form in Figure 8. This form is provided to aid the reader in visualizing the extent of the positive responses to each of the survey questions.

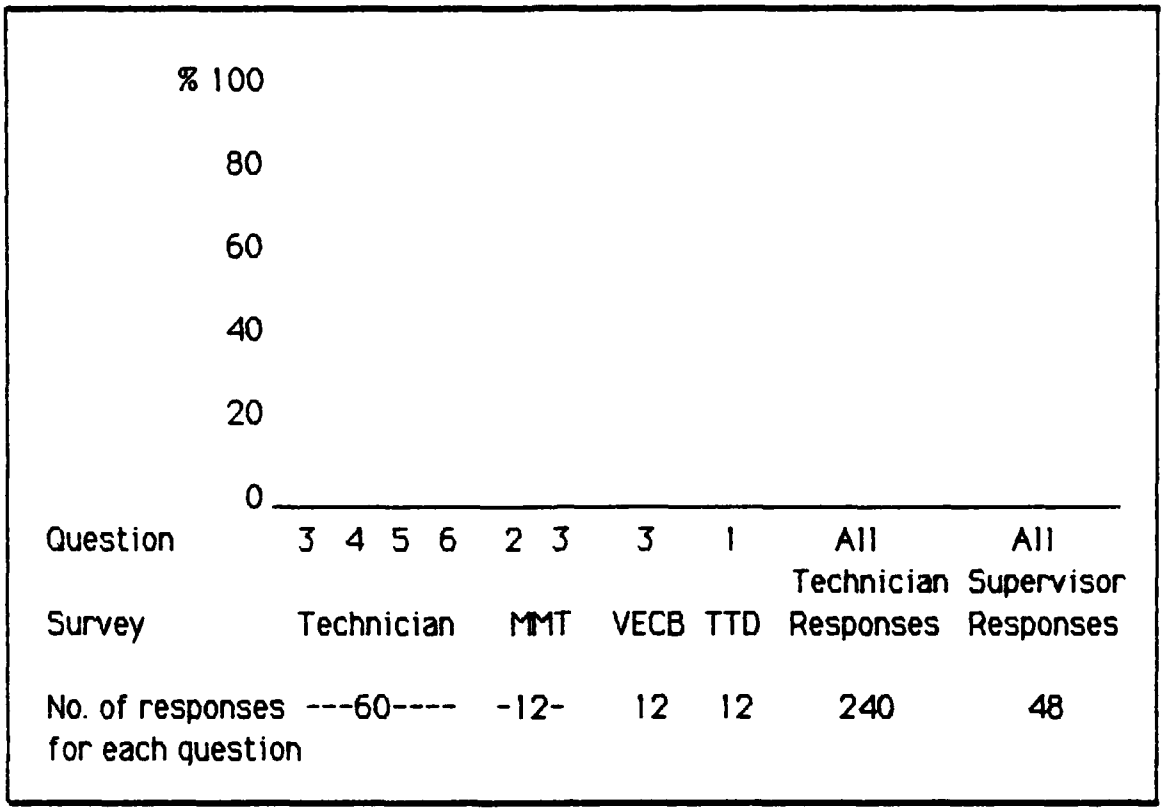

Figure 8. Data Display: High Morale Responses

A Contingency Table (33, 44, 29:734) will also be constructed to determine if 41 IX1 morale is affected by TTB waiting time. Two categories are compared, less than and more than two months wait in MMT prior to starting TTB. This will be accomplished by comparing a computed test statistic against the critical value of chi-square table statistic to determine the independence of categories (if independent, no difference exists). A complete discussion of Contingency Tables, including the definition, purpose, description and procedure for use is contained in Appendix E.

To construct this table, the high morale response for each question, as shown in Table VII, will be tabulated and entered into the Contingency Table shown in Table VIII.

TABLE VIII

Planned Analysis: Technician Morale by Length of Waiting Time

	LESS THAN 2 MONTHS	MORE THAN 2 MONTHS	ROW TOTALS
HIGH MORALE RESPONSES			
LOW MORALE RESPONSES			
COLUMN TOTALS			

A Two-Tailed Large Sample Test Of An Hypothesis About p (33, 44, 29:311) will also be used to determine if a significant difference exists between technicians and supervisors regarding the effect of waiting to enter TTB. This will be accomplished by testing at the .05 significance level to determine if the mean response of the two groups are essentially the same. The actual test procedure is reproduced in Figure 9.

Two-tailed test

H_0: $p=p_0$ technician and supervisor means are equal.

H_a: $p \neq p_0$ technician and supervisor means are not equal.

Test Statistic

$z = p-p_0 / \sigma_p$ where $\sigma_p = \sqrt{[p_0(1-p_0)]/n}$ assuming Ho is true

Rejection Region

$-z_{\alpha/2} > z > z_{\alpha/2}$

Figure 9. Large Sample Test Of An Hypothesis About p (29:311)

Research Question 2, *What effect does waiting to enter Team Training Branch initial technical training have on Missile Maintenance Technician performance?*, will be answered using information from the six MMB's, Training Control Divisions and Quality Control Divisions.

The required research will be conducted in two phases. The first phase requires each Quality Control to provide Initial post-TTB and First Year creditable evaluations on ten 411X1's. The final phase requires the MMT Section Training NCO's to provide pre-TTB waiting time in MMT and initial branch of assignment. This data will be evaluated using Contingency Tables to determine if waiting time affects evaluation ratings or if initial assignment affects evaluation ratings. This will be accomplished by comparing a computed test statistic against the critical value of chi-square table statistic to determine if the categories are independent. To conduct this comparison, Contingency Table analysis will be performed on four different subsets of data. Table IX is designed to determine if Initial Quality Control Division evaluation ratings are dependent on excessive TTB waiting time.

TABLE IX
Planned Analysis: Initial Performance by Time Awaiting Training

	LESS THAN 2 MONTHS	MORE THAN 2 MONTHS	ROW TOTALS
HIGHLY QUALIFIED			
QUALIFIED			
UNQUALIFIED			
COLUMN TOTALS			

Table X is designed to determine if First Year Quality Control Division evaluation ratings were dependent on having an excessive wait to enter TTB.

TABLE X
Planned Analysis: First Year Performance by Time Awaiting Training

	LESS THAN 2 MONTHS	MORE THAN 2 MONTHS	ROW TOTALS
HIGHLY QUALIFIED			
QUALIFIED			
UNQUALIFIED			
COLUMN TOTALS			

Table XI is designed to determine if Initial Quality Control Division evaluation results are dependent on First Year evaluation ratings.

TABLE XI
Planned Analysis: Initial vs First Year Performance

	INITIAL EVALUATIONS	FIRST YR EVALUATIONS	ROW TOTALS
HIGHLY QUALIFIED			
QUALIFIED			
UNQUALIFIED			
COLUMN TOTALS			

Table XII is designed to determine if Quality Control Division evaluation ratings are dependent on initial assignment.

TABLE XII
Planned Analysis: Performance Based on Initial Assignment

	INITIAL MMT ASSIGN	INITIAL OTHER BRANCH	ROW TOTALS
HIGHLY QUALIFIED			
QUALIFIED			
UNQUALIFIED			
COLUMN TOTALS			

Research Question 3, *Can personnel be fully utilized in other maintenance branches beside Missile Mechanical Branch for initial duty in the 41131 career field?*, will be answered using responses from three supervisory surveys (Appendices B-D). The questions in each of the surveys used to answer Research Question 3 are shown in Table XIII. These questions are designed to establish the feasibility of placing all new 41131's in VECB as an alternative to initial MMT assignment. Positive responses to initial VECB assignment are also shown in Table XIII. Enlisted Personnel telephone survey questions were not included in the Contingency Tables used to answer Research Question 3. This was done intentionally since it was felt that most 41 IX1's would not have both MMT and VECB experience.

TABLE XIII
Survey Questions/Responses Designed to Measure
Initial VECB Assignment Feasibility

	APPLICABLE SURVEY QUESTION		
RESEARCH QUESTION	MMT OIC/NCOIC	VECB OIC/NCOIC	TCD NCOIC, TTB NCOIC
3	6,7	4,5	2
positive initial VECB assignment responses	Y,Y	Y,Y	Y

The percentage of positive initial VECB assignment responses for each question in Table XIII will be shown in bar graph form in Figure 10. This form is provided to aid the reader in visualizing the extent of the positive responses to each of the survey questions.

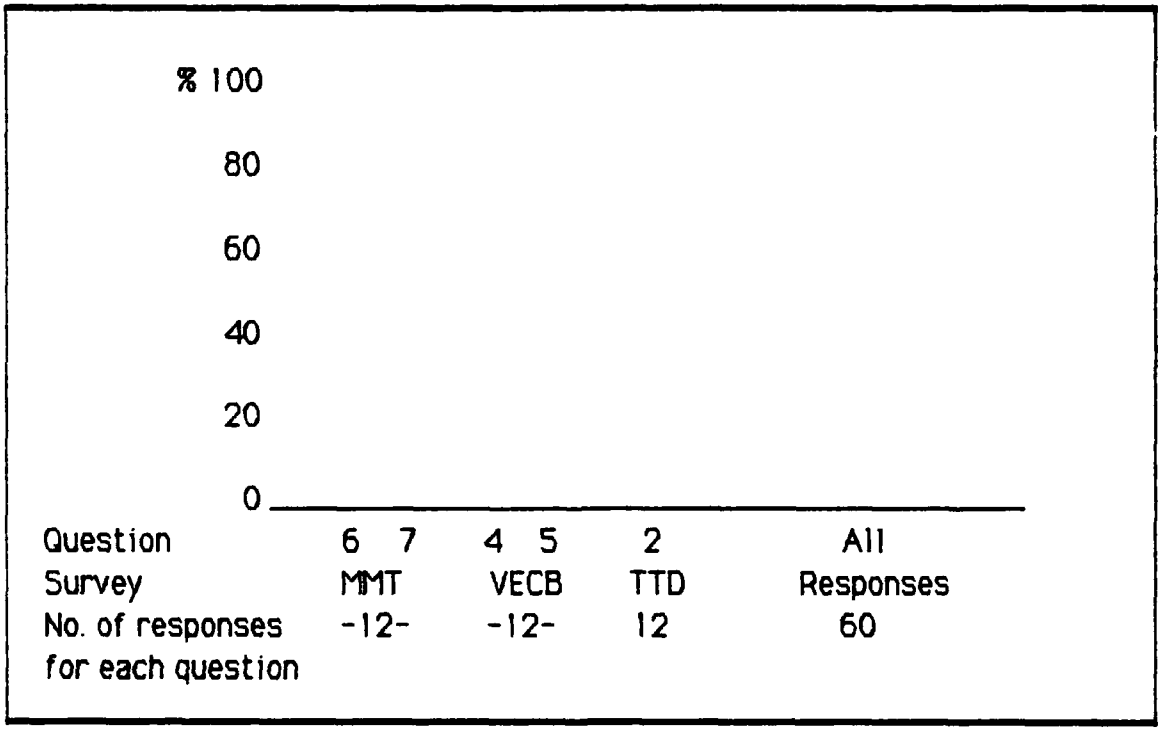

Figure 10. Data Display: Positive Initial VECB Assignment Responses

A Contingency Table analysis will be performed on the responses to determine whether a significant difference of opinion regarding the initial assignment of 411X1's exists between the following groups: Officers versus NCO's, all respondents with less than nine years missile maintenance experience versus all respondents with more than nine years missile maintenance experience and all NCO's with less than 12 years missile maintenance experience versus all NCO's with more than 12 years missile maintenance experience. This analysis will be accomplished by comparing the computed test statistic against the critical value of chi-square table statistic at the .05 level of significance to determine if the different categories are independent.

The three Contingency Table categories were differentiated in the following manner. Officer's and NCO's are generally regarded as being exclusive. The nine year point was considered significant since nine years of missile experience is required for the award of the Senior Missileman Badge. The 12 year point was chosen since most enlisted personnel with 12 years experience in maintenance can be considered to be career military since they will have sixteen years service at the end of their current enlistment.

The structure of the three Contingency Tables are provided in Tables XIV, XV, and XVI. Table XIV compares all maintenance officer responses against all maintenance NCO responses regarding the initial VECB assignment of 41131's in order to determine if positive responses to questions concerning the initial VECB assignment of 41131's are dependent on rank. This comparison will be shown in a table similar to Table XIV.

TABLE XIV
Planned Analysis: Officer/NCO Responses to Initial Assignment

	OFFICER	NCO	ROW TOTALS
INITIAL VECB ASSIGN			
INITIAL MMT ASSIGN			
COLUMN TOTALS			

Table XV compares all respondents with less than nine years maintenance experience against those with more than nine years of missile maintenance experience to determine if positive responses to initial VECB assignment are dependent on years of experience. This comparison will be shown in a table similar to Table XV.

TABLE XV
Planned Analysis: Initial Assignment Responses by Respondents With More or Less Than 9 Years of Missile Maintenance Experience

	LESS THAN 9 YRS	MORE THAN 9 YRS	ROW TOTALS
INITIAL VECB ASSIGN			
INITIAL MMT ASSIGN			
COLUMN TOTALS			

Table XVI compares all respondents with less than 12 years missile maintenance experience against those with more than 12 years of missile maintenance experience in order to determine if positive responses to initial VECB assignment are dependent on career intention.

TABLE XVI
Planned Analysis: Initial Assignment Responses by NCO Respondents With More or Less Than12 Years of Missile Maintenance Experience

	LESS THAN 12 YRS	MORE THAN 12 YRS	ROW TOTALS
INITIAL VECB ASSIGN			
INITIAL MMT ASSIGN			
COLUMN TOTALS			

Summary

This chapter developed the methodology employed to answer the three Research Questions posed in Chapter 1. In answering these three Research Questions, Contingency Tables and a Large-Sample Test Of An Hypothesis About p were utilized to determine if significant differences in perception exist between different groups of Minuteman Missile maintainers, whether performance was affected by technicians having to wait for various periods prior to starting initial technical training, and whether performance was affected as a result of initial technician assignment.

Chapter V

Results

Overview

An analysis of the data compiled in the four telephone surveys and from Quality Control evaluation ratings was conducted to determine if 41131 morale and proficiency were affected by the length of waiting experienced prior to entering TTB. The data collected provided the researcher with information about technician and supervisor perspectives regarding morale and personnel utilization. This data also provided the researcher with Quality Control evaluation results which were used to measure proficiency. The first portion of this chapter discusses the final data base used in the analysis, discussing the differences between the projected data base and the final data base. The second section presents the research results and the final section analyzes the data using Contingency Tables and a Large Sample Test Of An Hypothesis About p test.

Determination of the Final Data Base

Every effort was made to contact the personnel identified in the Sampling Plan discussed in Chapter 4. This proved to be unsuccessful in all cases for several reasons. A breakdown of these reasons and a description of the actual data base by survey follows.

The Training Control Division supervisor survey, Appendix D, included all 12 of the personnel initially selected to participate. The Vehicle and

Equipment Control Branch supervisor survey, Appendix C, includes 11 of the 12 personnel initially selected to participate. The person not contacted, an NCOIC, was on extended leave and was replaced by the Equipment Section NCOIC. This substitution was not thought to be detrimental since this individual had more Minuteman Missile maintenance experience than most of the other NCOIC respondents. The Missile Mechanical Branch supervisor survey, Appendix B, includes 10 of the 12 personnel initially selected to participate. The personnel not contacted, an NCOIC on leave and an OIC not currently assigned, were replaced by the MMT Section NCOIC and the Assistant OIC. The Assistant OIC had more Minuteman Missile maintenance experience than a majority of the other OIC respondents. The NCOIC had less experience than any of the other NCOIC respondents.

The Enlisted Personnel survey included the full number of the planned sample of 60 41131/51's. The original data collection plan called for 10 per wing; however, because of personnel shortages in several MMT Sections, the final data base contained from 6 to 15 per wing. The limited availability of technicians in the immediate MMT Section office area proved to be a major hurdle in gathering the necessary responses. The initial call to each wing resulted in interviews with all the 41131's in AWT status. Calls made on ancillary training days accounted for the majority of dispatching 411X1's interviews. Additional calls were required before and after team dispatches. After dispatch calls were attempted first and were only minimally successful in contacting personnel since return to base times vary, depending on maintenance performed. Calls prior to dispatch were made as a last resort since teams must meet their departure times and technicians must perform a myriad of tasks in preparation for departure. As a result,

great care was taken to avoid slowing down dispatching teams, even at the expense of foregoing interviews. Also complicating data collection was the researchers own requirement to have no more than two members of one team participate in the survey. This was increased to three when it became evident that contact with technicians would be more difficult than expected. This increase resulted in three cases where three members of one team responded to the survey. None of these instances occurred at a wing where less than ten responses were recorded.

The technician evaluation data base, collected from Quality Control and MMT records included data for 60 41131/51's. As planned, each Quality Control Division provided data on 10 technicians with no more than two team members being included in each sample. The Initial and First Year evaluation requirements resulted in the utilization of several personnel who were no longer active MMT team members since several active teams did not have the required number of evaluations. This was not considered a detriment since the data collected did not require standardization by time period. Utilization of these personnel did require the MMT Section Training NCO to contact six personnel to obtain approximate TTB waiting times (actual dates are purged from the computer when a 411X1 changes duty sections). Since none of the times provided were near 60 days, it is assumed that none of these times were mis-categorized for purposes of the research.

Presentation of Research Results

Actual telephone survey data is included in Appendix F, and Quality Control evaluation data is in Appendix G. For analysis purposes, relevent data for each Research Question will be presented when required.

Research Question 1. The data relevent in answering Research Question 1 is included in Appendix F and will also be summarized in bar graph format in Figure 11.

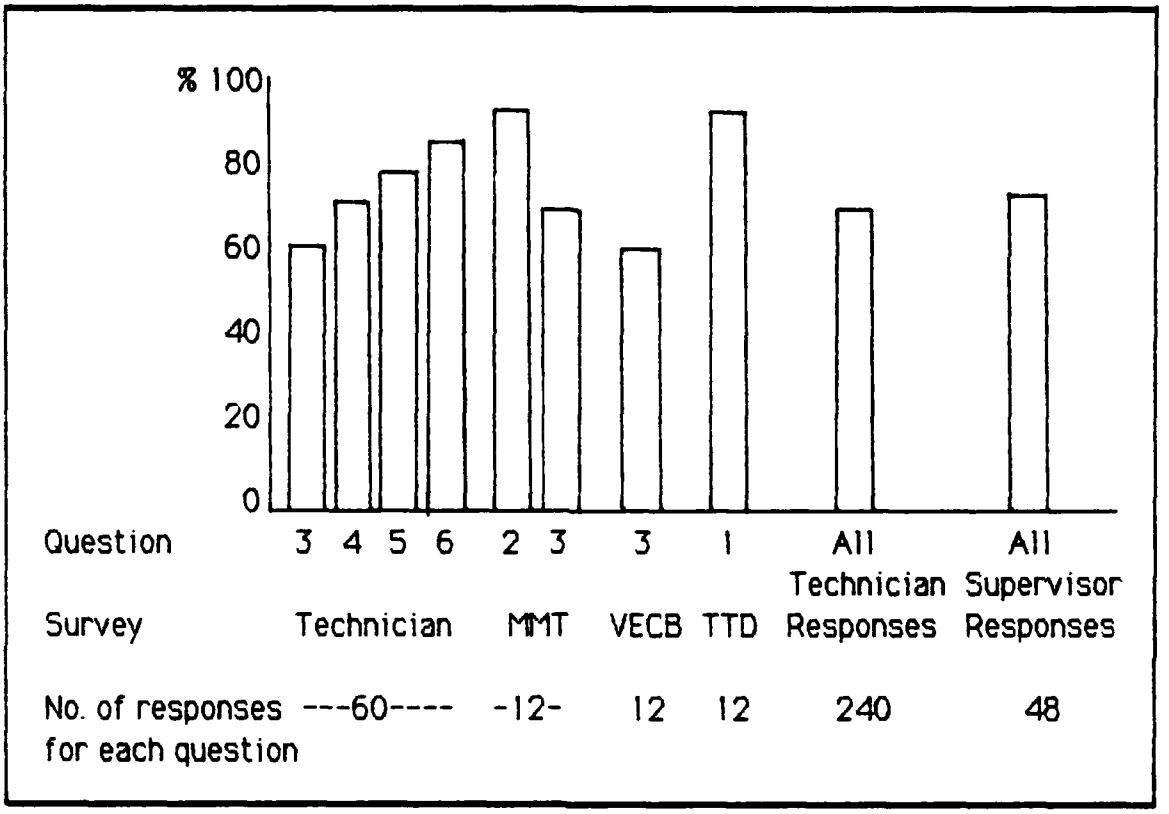

Figure 11. Research Results: High Morale Responses

Also relevent to Research Question 1 is the percentage of high morale responses from technicians with TTB waiting times of less than or more than two months. This data resulted in 87 high morale and 21 low morale responses for personnel with less than two months TTB waiting time and 90 high morale and 42 low morale responses for personnel with more than two month TTB waiting time. This data will be shown in Table XVII as a Contingency Table in the analysis portion of this chapter.

Research Question 2. The data relevent in answering Research Question 2 is included in Appendix G. As this appendix shows, the Initial evaluations of these 60 personnel resulted in 54 HQ's, 118 Q's, and 8 UQ's. First Year evaluations for the same personnel resulted in 75 HQ's, 155 Q's, and 10 UQ's. This data was restratified by personnel with less than or more than two months TTB waiting time and by intial maintenance assignment. These comparisons will be shown in Tables XVIII, XIX, XX and XXI, as Contingency Tables in the analysis portion of this chapter.

Research Question 3. The data relevent in answering Research Question 3 is included in Appendix F and is also summarized in bar graph format in Figure 12. This data was also restratified to compare different supervisor sub- populations, and the results of this restratification will be shown in Tables XXII, XXIII, and XXIV in the analysis portion of this chapter.

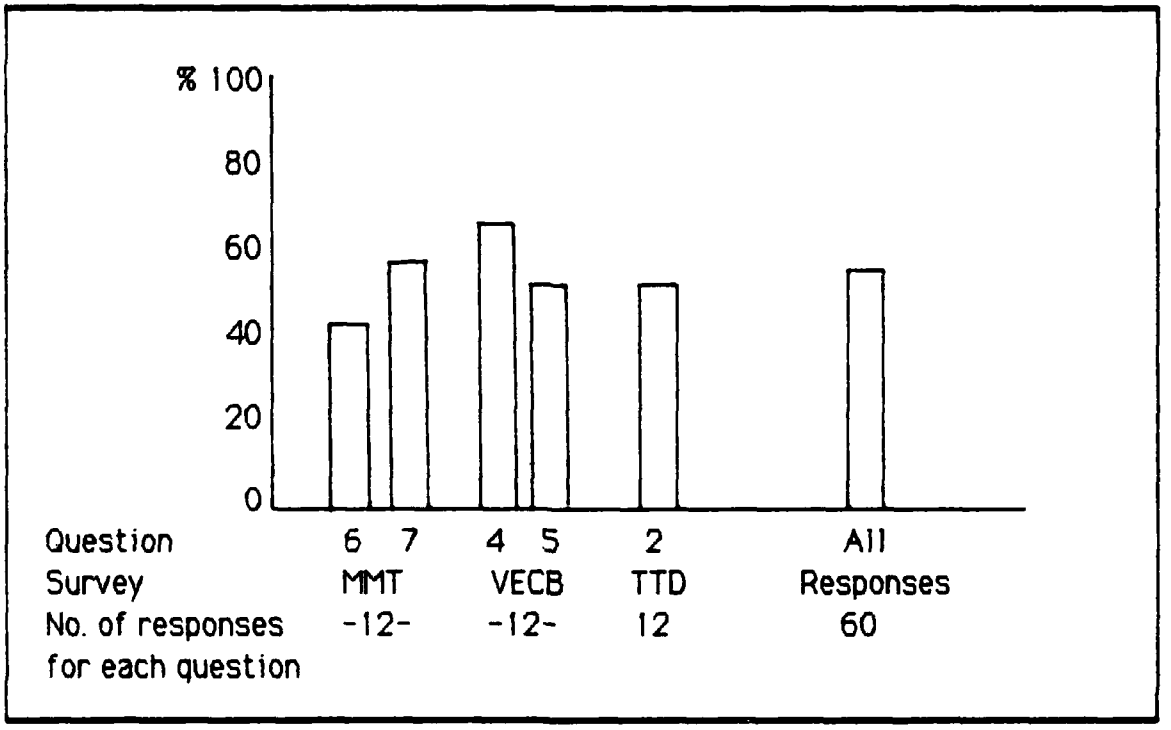

Figure 12. Research Results: Positive Initial VECB Assignment Responses

Open Ended Question Results. Each telephone survey contained one or more open ended questions. Appendix F lists the responses to these survey questions. In some cases, more than one response was given to these questions. For purposes of quantifying the responses, the first response was used when tabulating the results presented in the following paragraphs.

The Enlisted Personnel survey open ended question, question 7, "What did you dislike most about waiting to enter training?", resulted in the following responses: halls and walls (section clean-up details) 35, boring (no challenge) 14, squadron details 8, and parts runs 3.

The Training Control Division supervisor survey open ended question, question 4, "In your opinion, what is the effect of a long TTB waiting time on 41131's?", resulted in the following responses: decreased motivation 8, loss of skills learned in tech school 2, and no effect 2.

The VECB supervisor survey open ended question, question 6, " In your opinion, what are the advantages or disadvantages of assigning all new 41131's to VECB as opposed to assignment in MMT?", resulted in the following advantage responses: provides experience-5, none-4, provides jobs for personnel-2, and gives VECB a mix of new and old personnel-1, and the following disadvantage responses: none-6, new 41131's don't have enough job knowledge-3, and new 41131's go to MMT after VECB gets them trained-3. A second open ended question, survey question 2, "Would you prefer to get an untrained Missile Maintenance Technician (41131) right out of technical school or a trained Missile Maintenance Technician (41151) from MMT?", resulted in 4 three level responses and 8 five level responses. Six respondents further stated that attitude was a more important factor than the skill level. Higher morale was the major factor in three level selection while

job knowledge was the major factor in five level selection.

The MMB supervisor survey open ended question, question 6, "In your opinion, what is the effect of long TTB waiting time on 41131's?", resulted in the following responses: lower morale-8, none-3, and no productivity-1. Survey question 8, regarding the existence of formal pre-TTB training resulted in 3 yes and 3 no answers. The formal programs consisted of dispatching to the field as a non-working sixth man and parts runs. The other three respondees indicated that their personnel completed ancillary training and performed details as required while waiting to begin TTB.

Analysis of Results

Research Question 1. This question was answered using a Contingency Table to compare high and low morale responses by TTB waiting times of less than or more than two months and by using a Large Sample Test Of An Hypothesis About p. The results of the Contingency Table analysis are provided in Table XVII.

TABLE XVII
Research Results: Technician Morale by Length of Waiting Time

	LESS THAN 2 MONTHS	MORE THAN 2 MONTHS	ROW TOTALS
HIGH MORALE RESPONSES	87 (79.65)	90 (97.35)	177
LOW MORALE RESPONSES	21 (28.35)	42 (34.65)	63
COLUMN TOTALS	108	132	240

The comparison of expected (in brackets) versus actual figures resulted in a value of 4.698. Since this exceeds the table value of 3.841 for the .05 level of significance with one degree of freedom, sufficient evidence exists to conclude that morale is dependent on TTB waiting time. This indicates that a significantly lower morale exists among technicians who have waited in MMT for more than two months to begin TTB training.

The MMB supervisor survey open ended question, question 6, lends credence to this result. Eight of 12 respondents indicated that morale is negatively affected by excessive TTB waiting time. The Training Control Division supervisor survey question, question 4, also resulted in eight of 12 respondents indicating that excessive waiting for TTB decreased motivation.

The ability of these supervisors to accurately perceive technician morale was tested and proven through the use of a Large Sample Test Of An Hypothesis About p. This test was performed to determine if supervisor perceptions of technician morale differed significantly from the technician's actual responses. The data utilized for this test was the percentage of all technician responses and supervisor responses listed in Figures 11 and 12. This data provided a p_0 value (supervisor mean) of .7708 and a p value (technician mean) of .7375. The test of equivalency resulted in a value of -1.2274 which fell within the acceptance range of $-1.96 < Z < 1.96$ at the .05 level of significance. This test shows that supervisor's have an adequate perception of technician morale.

As a result of the Contingency Table analysis, the supervisory open ended question responses and the validation of the accuracy of their perception of technician morale, it can be concluded that extended TTB waiting time results in a significant decrease in 41131 morale.

Research Question 2. This question was answered using four Contingency Tables. The first table compared initial evaluation results by TTB waiting time. The results of this comparison are shown in Table XVIII.

TABLE XVIII
Research Results: Initial Performance by Time Awaiting Training

	LESS THAN 2 MONTHS	MORE THAN 2 MONTHS	ROW TOTALS
HIGHLY QUALIFIED	24 (21.6)	30 (32.4)	54
QUALIFIED/ UNQUALIFIED	48 (50.4)	78 (75.6)	126
COLUMN TOTALS	72	108	180

The shortage of actual Unqualified ratings resulted in the pooling of Qualified and Unqualified ratings (33) since the expected value of the Unqualified rating cells equaled 3.2 and 4.8, respectively, and did not meet the minimum expected cell value of 5 required for Contingency Table use. This pooling resulted in the loss of the Unqualified category and only allowed for a comparison of above average proficiency against a combined average and below average proficiency. However, since there were so few Unqualified ratings, loss of this category can not be considered significant since the number of occurrences were too small to form valid conclusions.

The comparison of the expected (in brackets) versus actual figures of the modified table resulted in a value of .635. Since this did not exceed the table value of 3.841 for the .05 level of significance with one degree of freedom, insufficient evidence exists to conclude that Initial evaluation ratings are dependent on TTB waiting time. This lack of evidence means that TTB waiting time has no meaningful effect on Initial evaluation ratings.

The second table compared First Year evaluation results by TTB waiting time. The results of this comparison are shown in Table XIX.

TABLE XIX
Research Results: First Year Performance by Time Awaiting Training

	LESS THAN 2 MONTHS	MORE THAN 2 MONTHS	ROW TOTALS
HIGHLY QUALIFIED	37 (30)	38 (45)	75
QUALIFIED/ UNQUALIFIED	59 (66)	106 (99)	165
COLUMN TOTALS	96	144	240

The shortage of actual Unqualified ratings resulted in the pooling of Qualified and Unqualified ratings since the expected value of the Unqualified cell for less than two months equaled 4 and did not meet the minimum expected cell value of 5 required for Contingency Table use. This pooling

resulted in loss of the Unqualified category and only allowed for comparison of above average proficiency against a combined average and below average proficiency. However, this was not considered significant since the number of Unqualified occurrences were too small to form valid conclusions.

The comparison of the expected (in brackets) versus actual figures of the modified table resulted in a value of 3.959. Since this exceeded the table value of 3.841 for the .05 level of significance with one degree of freedom, sufficient evidence exists to conclude that First Year ratings are dependent on waiting time. This indicates that these ratings are significantly better for 411X1's who wait less than two months to begin TTB. This improved proficiency is probably due to the intensity of TTB training. Over time, morale may be more important than training in sustaining proficiency.

The third table compared Initial versus First Year evaluation ratings. The results of this comparison are shown in Table XX.

TABLE XX
Research Results: Initial vs First Year Performance

	INITIAL EVALUATIONS	FIRST YR EVALUATIONS	ROW TOTALS
HIGHLY QUALIFIED	54 (55.286)	75 (73.714)	129
QUALIFIED	118 (117)	155 (156)	273
UNQUALIFIED	8 (7.714)	10 (10.286)	18
COLUMN TOTALS	180	240	420

The comparison of the expected (in brackets) versus actual figures resulted in a value of .086. Since this did not exceed the table value of 5.991 for the .05 level of significance with two degrees of freedom, insufficient evidence exists to conclude that Initial evaluation results are dependent on type of evaluation. This finding indicates that no significant difference exists between Initial and First Year evaluation ratings. This indicates that the relative distribution of ratings is essentially the same for both Initial and First Year evaluation ratings.

The final table compared both types of evaluation results based on initial assignment. The results of this comparison are shown in Table XXI.

TABLE XXI
Research Results: Performance Based on Initial Assignment

	INITIAL MMT ASSIGN	INITIAL OTHER BRANCH	ROW TOTALS
HIGHLY QUALIFIED	70 (70.95)	59 (58.05)	129
QUALIFIED	155 (150.15)	118 (122.85)	273
UNQUALIFIED	6 (9.9)	12 (8.1)	18
COLUMN TOTALS	231	189	420

The comparison of the expected (in brackets) versus actual figures resulted in a value of 3.790. Since this did not exceed the table value of

5.991 for the .05 level of significance with two degrees of freedom, insufficient evidence exists to conclude that evaluation ratings are dependent on initial assignment. This finding indicates that no significant difference exists between the ratings received by technicians initially assigned to MMT and technicians initially assigned to another branch. However, the results do indicate that 411X1's assigned to another branch (every respondent in this category had been in VECB, no other branches were represented) have a higher percentage of HQ's and UQ's than those assigned to MMT.

As a result of the Contingency Table Analysis', based on time AWT, Quality Control Initial ratings and initial assignment, proficiency is not affected. However, Contingency Table analysis of First Year ratings shows that proficiency is detrimentally affected by excessive waiting time.

Research Question 3. This question was answered using three Contingency Tables. The first of these tables compared officer and NCO responses to questions related to initial 41131 assignment. The results of this comparison are shown in Table XXII.

TABLE XXII
Research Results: Officer/NCO Responses to Initial Assignment

	OFFICER	NCO	ROW TOTALS
INITIAL VECB ASSIGN	12 (12.8)	20 (19.2)	32
INITIAL MMT ASSIGN	12 (11.2)	16 (16.8)	28
COLUMN TOTALS	24	36	60

The comparison of the expected (in brackets) versus actual figures resulted in a value of .178. Since this did not exceed the table value of 3.841 at the .05 level of significance with one degree of freedom, insufficient evidence exists to conclude that the responses were dependent on rank. This finding indicates that the preference of officers and NCOs are essentially the same. As their responses indicated, both were almost equally split on the the issue of initial assignment of technicians.

The second table compared the initial assignment preferences of all supervisors with less than or more than nine years of missile maintenance experience. The results of this comparison are shown in Table XXIII.

TABLE XXIII
Research Results: Initial Assignment Responses by Respondents With More or Less Than 9 Years Of Missile Maintenance Experience

	LESS THAN 9 YEARS	MORE THAN 9 YEARS	ROW TOTALS
INITIAL VECB ASSIGN	16 (17.6)	17 (15.4)	33
INITIAL MMT ASSIGN	16 (14.2)	11 (12.6)	27
COLUMN TOTALS	32	28	60

The comparison of the expected (in brackets) versus actual figures resulted in a value of .694. Since this did not exceed the table value of 3.841 at the .05 level of significance with one degree of freedom, insuffi-

cient evidence exists to conclude that supervisor responses are dependent on senior missileer status. This finding indicates that the preference for initial assignment of technicians does not vary significantly based on missile maintenance experience level.

The third table compared the initial assignment preferences of all NCOs with less than or more than 12 years of missile maintenance experience. The results of this comparison are shown in Table XXIV.

TABLE XXIV
Research Results: Initial Assignment Responses by NCO Respondents With More or Less Than 12 Years of Missile Maintenance Experience

	LESS THAN 12 YEARS	MORE THAN 12 YEARS	ROW TOTALS
INITIAL VECB ASSIGN	5 (6.67)	15 (13.33)	20
INITIAL MMT ASSIGN	7 (5.33)	9 (10.67)	16
COLUMN TOTALS	12	24	36

The comparison of the expected (in brackets) versus actual figures resulted in a value of 1.411. Since this does not exceed the table value of 3.841 at the .05 level of significance with one degree of freedom, insufficient evidence exists to conclude that the responses of NCOs are dependent on career status. This finding indicates that junior supervisors and senior supervisors are equally split on the issue of initial technician assignment.

The three Contingency Table analysis' confirm that positive responses to initial assignment to VECB are not significantly different over the sub-categories of rank, experience, or career status. The responses do indicate that VECB supervisors are more strongly in favor of initial VECB assignment, 15 of 24 positive responses, while MMB and Training Control Division supervisors are neutral, 18 of 36 responses were positive.

The Contingency Table analysis used to answer Research Question 2, Table XXI, which compared evaluation ratings based on initial assignment to another branch against initial assignment to MMT, also failed to provide a strong argument for initial assignment since this analysis did not find a significant difference in ratings as a result of assignment.

Question 4 of the Enlisted Personnel survey resulted in a 72 percent response rate for initial MMT assignment. The responses of the 60 technicians are further broken down to show the extent of support for initial MMT assignment as follows: technicians in AWT status 12 of 15, technicians with initial VECB experience 14 of 17, technicians who waited less than two months to start TTB 19 of 27, and technicians who waited more than two months to start TTB 24 of 33.

The first VECB supervisor survey open ended question, question 2, is somewhat contradictory to technician responses since, when asked to choose between a three level and a five level, 8 of 12 selected the five level. This indicated that supervisors preferred to have a five level over a three level initially assigned to VECB. When asked to explain their choice, higher morale was the major factor in three level selection while job knowledge was the major factor in five level selection. The second open ended question, question 6, on the advantages and disadvantages of initial VECB

assignment was more positive toward initial assignment. The advantages of providing experience and a job were given by 7 of the 8 personnel who expressed an opinion. The disadvantage of not enough job knowledge was given by 3 of the 6 personnel who expressed an opinion.

It therefore appears, based on the evaluation and survey results, that initial assignment to another branch beside MMB is possible. Note: (Since research was based on technician interviews and evaluation ratings, and since all technicians with previous experience in "another branch" had that experience in VECB, responses indicating "another branch" should be considered as VECB for purposes of this research). However, individual survey questions seem to indicate that supervisors do not appear to be strongly in favor of, and technicians appear to be definitely against, initial VECB assignment.

Actual Waiting Time. The following waiting times were recorded in this research. As the data indicates, the average waiting time was well above the 2.00 months considered excessive for purposes of this research. This excessive waiting time can be shown by comparing the time awaiting training figures compiled during this research. The data compiled in the Enlisted Personnel survey (Appendix F) indicates that AWT time averaged 3.45 months. Prior VECB personnel averaged 1.75 months and personnel assigned to MMT waited an average of 4.30 months. The data obtained from the Quality Control evaluations (Appendix G) indicates that AWT time averaged 4.13 months. Prior VECB personnel averaged 2.67 and personnel assigned to MMT waited an average of 5.33 months. When the data base is reduced by the 15 personnel who appeared in both appendices, AWT time for the remaining 105 data points equaled 3.80 months. Prior VECB personnel averaged

2.30 months and personnel initially assigned to MMT averaged 4.84 months.

As these statistics indicate, waiting time for personnel initially assigned to MMT is 2.54 months longer than personnel who are initially assigned to VECB and then go to MMT for TTB training. This difference results for two reasons. Personnel assigned to VECB are able to perform much of the ancillary training required for MMT/TTB while assigned to VECB. In addition, the personnel in VECB can remain productively employed in VECB until a full team is available to start training, thereby reducing the time spent waiting to begin TTB training.

Summary

The projected data base differed from the final data base in several respects. The most significant difference concerned the Enlisted Personnel survey which utilized varying numbers of respondents, from 6-15 per wing, instead of the projected 10 per wing. This was not considered significant enough to invalidate the research since replacement respondents were part of the population of Minuteman Missile Mechanical Team Section members that were canvassed in this research. The presentation and analysis of the data outlines the open ended question responses and Contingency Table results. This analysis was solely concerned with independence of the different stratified categories at the .05 level of significance. These analyses were used to answer the three Research Questions posed in Chapter 1. These analyses showed that extended TTB waiting time reduces 41131 morale, that First Year evaluation ratings were detrimentally affected by excessive TTB waiting time and that initial assignment to other branches beside MMB is possible.

Chapter VI

Summary, Conclusions and Recommendations

Overview

The first portion of this chapter reviews the key aspects of this research effort in order to prepare the reader for the research conclusions. The second portion summarizes the conclusions reached for each of the three Research Questions posed in Chapter I. The final portion of this chapter provides a recommendation for the initial assignment of 41131's and several recommendations for continuing research in the area of 411X1 morale and proficiency.

Summary of Research Effort

The ability of the Strategic Triad to be a credible deterrent to nuclear war rests on the ability of the component parts to maintain the highest alert readiness possible. This research effort focused on the ICBM portion of the triad, and more specifically the Minuteman Missile weapon system. The research attempted to determine if morale and proficiency suffer as a result of the current method of assigning new 41131's. This proficiency factor is critical since substandard maintenance has a direct relationship to decreased readiness.

To measure morale and proficiency, telephone interviews were conducted with 411X1's and their supervisors, and Quality Control evaluation ratings were obtained on a sample of 60 MMT Section technicians. This data

was then analyzed using Contingency Table analysis to determine independence at the .05 level of significance among a number of stratified categories. These categories included Initial and First Year evaluation ratings by TTB waiting time, initial technician assignment and by supervisor rank and experience.

Conclusions

Research Question 1. Research Question 1 asked whether 41131 morale decreased as a result of excessive TTB waiting time. Based on the research data, there is sufficient evidence to conclude that 41131 morale decreases when forced to wait longer than two months to begin TTB initial technical training. Although the percentage of high morale responses for the survey questions in the Enlisted Personnel survey was 73.8 percent, a significant difference existed between respondents with less than or more than two months waiting time. Respondents with less than two months had a high morale response rate of 81 percent while respondents with more than two months waiting time had a high morale response rate of only 68 percent. Supervisors perception of technician morale was also researched through the use of structured and open ended questions and found that technician morale decreases as a result of excessive TTB waiting time.

Research Question 2. Research Question 2 asked whether waiting to enter TTB initial technical training affected 411X1 proficiency. Based on the research data, there is sufficient evidence to conclude that excessive waiting times have a negative impact on MMT Section technician proficiency in the long term. Three other Contingency Table Analysis', based on time AWT, based on Quality Control Initial evaluation ratings and based on initial

assignment, failed to show any significant difference in proficiency between the categories compared.

The finding of significance on First Year evaluation ratings indicates that First Year proficiency is affected by TTB waiting time. As a result, it appears that the morale problem identified in Research Question 1 may cause long term degeneracy in 411X1 proficiency.

Research Question 3. Research Question 3 asked whether 411X1's could be fully utilized in other maintenance branches besides MMB for initial assignment in the 41131 career field. Based on the research data, there is evidence to conclude that initial assignment to VECB is possible. However, supervisors are not strongly in favor, and technicians are definitely against, initial VECB assignment.

Supervisor responses on the issue of initial technician assignment were almost equally divided with VECB supervisors more in favor and MMB and Training Control Division supervisors being neutral. However, VECB supervisors selected five levels over three levels when asked to select one or the other in 8 of 12 responses due primarily to the job knowledge a five level gains in MMT. These supervisors also stressed the importance of attitude in the assignment of technicians to VECB.

Technicians favored initial MMT assignment 72 percent to 28 percent even though they responded to the Enlisted Personnel open ended survey question, question 7, which asked what they disliked the most about pre-TTB waiting, in a strongly negative tone. Boredom accounted for 23 percent of the responses and halls and walls (clean-up details) accounted for 58 percent of the responses. These dislikes did not appear to override the respondents desire to begin their careers in MMT.

Quality Control evaluation ratings for initially assigned to VECB vs initially assigned to MMT (Table XXI) failed to provide a strong argument for either branch since the Contingency Table analysis failed to find dependency at the .05 level of significance. The data compiled during this research did indicate a higher percentage of HQ'S and UQ'S for initially assigned to VECB personnel, however, it was not great enough to find dependency.

Since supervisors regarded experience and attitude as important pre-requisites to VECB success, and since technicians overwhelmingly wanted to begin their careers in MMT, it would seem that from standpoint of technician morale initial assignment to MMT is preferable to initial assignment to VECB.

Since Pneudraulics and Mechanical Shop are highly technical, three level assignment to these sections does not appear to be a viable alternative. Staff assignment of three levels also appears to be out of the question due the level of expertise required to perform effectively.

Overall Conclusion. To reiterate, Research Question 1 found that morale decreases as TTB waiting time becomes excessive. Research Question 2 found that proficiency is negatively affected by excessive TTB waiting time in the long run, but not in the short run. Research Question 3 found that initial assignment can be made to other branches beside Missile Mechanical Branch. By grouping the results of these questions together they can be summarized into six specific findings.

1. Average TTB waiting time was shown to be excessive, by the HQ SAC/LGB definition of excessive, since the 105 different personnel who are reflected in Appendices F and G averaged 3.80 months.

2. Excessive waiting times decrease morale. As the data indicated, high morale responses for the

AD-A160 841 AN ANALYSIS OF THE EFFECTS OF TEAM TRAINING BRANCH WAITING TIME ON THE AT..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. G J DORSEY 2/2

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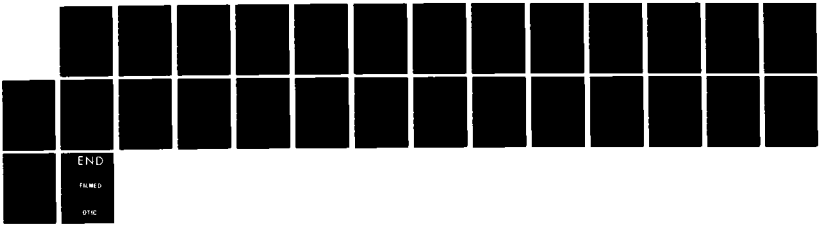

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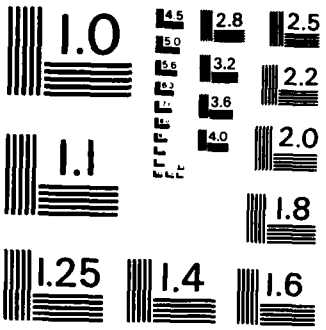

Enlisted Personnel survey questions were 81 percent for those with less than two months waiting time and only 68 percent for those with more than two months waiting time.

3. Excessive waiting times decrease long-term proficiency. As Table XIX indicated, First Year ratings were substantially lower for personnel who had experienced TTB waiting time of more than two months.

4. Assignment to another branch beside MMB is possible, since testing found no significant difference in ratings, or proficiency, between personnel initially assigned to MMT and personnel initially assigned to another branch. Note: (During the course of this research, no person was found have begun in a branch beside MMB or VECB).

5. Supervisors were essentially neutral on the issue of initial technician assignment (32 of 60 responses favored VECB).

6. Missile Maintenance Technicians overwhelmingly, (72 percent) favored MMB as the initial branch of assignment. Even the 33 personnel who had experienced excessive TTB waiting time favored initial assignment to MMT in 73 percent of their responses.

These six specific findings lead to the conclusion that initial assignment should be made to VECB instead of the MMT Section unless a TTB training team is ready to start immediately (within six weeks). This conclusion is based on the fact that TTB waiting time have been shown to be excessive for personnel initially assigned to MMT, that this excessive waiting time significantly decreases morale and that this excessive waiting time signifi-

cantly decreases long term proficiency. Since morale and long term proficiency have been shown to be negatively affected by excessive waiting time, the initial assignment of technicians to VECB would decrease average TTB waiting time below the two month period defined as excessive. This decrease in excessive TTB waiting should alleviate the reduced proficiency that was found to occur in First Year evaluation ratings of personnel who had waited more than two months to begin initial technical training.

Recommendation

As a result of this research it is recommended that most Missile Maintenance Technicians (41131's) be initially assigned to VECB unless a TTB training team is ready to start immediately (within six weeks). As the research showed, waiting time decreases morale and long term proficiency. Assignment to VECB would significantly decrease this waiting time thereby increasing long term proficiency. Morale would also increase for technicians in MMT as a result of decreased TTB waiting time, however, their desire to begin in MMT will require that VECB's image be improved, possibly during schooling at Chanute and more importantly at the wing itself, to insure that the performance of this branch does not suffer from poor morale.

Suggestions for Further Research

This research attempted to evaluate proficiency based on wing level Quality Control evaluation results. This study could be expanded upon by gathering similar evaluation data from the 3901st Strategic Missile Evaluation Squadron (SMES) to determine if similar results would be obtained.

A similar study, with the data expanded to include the amount of time

spent in VECB prior to going to MMT for TTB training, could also be conducted. This data could be used to determine if relationships exist between proficiency, or morale, and total on-base time prior to starting TTB training. These relationships could then be evaluated to determine if the total time delay in entering TTB is deleterious to proficiency or morale.

A third recommendation for follow-on research involves an expansion of the nominal data used to evaluate morale in this research effort, perhaps by using Likert scale surveys. This would allow the researcher to regress the results, something that was not possible using nominal data.

A fourth recommendation would be to compare the 411X1 personnel currently assigned to the Missile Mechanical Team Section against the 411X1 personnel assigned to Missile Handling Team Section in a manner similar to the research performed in this paper to determine whether significant differences in morale, job satisfaction and proficiency occur as a result of method of training, OJT versus TTB initial technical training.

A final recommendation would require an exploration of the pre-TTB Missile Mechanical Team Section environment to gather information and develop a proposal for a comprehensive pre-TTB training program.

A Final Note

As of 31 March 1985, technician evaluation criteria has changed to delete the requirement for initial post-TTB evaluations as a result of a change to SACR 66-12, Volume 5. This did not affect the data base used in this research since technicians utilized in this research had all graduated from TTB prior to July 1984.

Appendix A: Enlisted Personnel (41131/41151)
Telephone Sample Survey

1. WHEN DID YOU GRADUATE FROM TECHNICAL SCHOOL?

2. WHEN DID YOU START TTB, OR IF YOU HAVE NOT ENTERED TTB, WHEN IS YOUR PROJECTED START DATE?

3. DO YOU FEEL THAT YOUR SUPERVISORS PROVIDED YOU WITH CHALLENGING, USEFUL PROJECT'S PRIOR TO ENTERING TTB? (Y/N)

4. WOULD YOU RATHER HAVE BEEN ASSIGNED TO VECB WHILE AWAITING TTB? (Y/N)

5. DO YOU THINK THE WAIT TO ENTER TTB NEGATIVELY IMPACTED YOUR IMPRESSION OF THE 411X1 CAREER FIELD? (Y/N)

6. DO YOU THINK THE WAIT TO ENTER TTB NEGATIVELY IMPACTED YOUR IMPRESSION OF THE AIR FORCE? (Y/N)

7. WHAT DID YOU DISLIKE THE MOST ABOUT WAITING TO ENTER TRAINING?

Appendix B: MMB OIC/NCOIC Telephone
Population Survey

1. HOW LONG HAVE YOU BEEN IN MISSILE MAINTENANCE?

2. DO YOU FEEL THAT LONG DELAYS IN ENTERING TTB (MORE THAN TWO MONTHS) CONTRIBUTE TO LOWER MORALE AMONG NEW PERSONNEL? (Y/N)

3. DO YOU FEEL THAT THE TYPES OF DUTIES ASSIGNED TO PRE-TTB MISSILE MAINTENANCE TECHNICIANS ARE CHALLENGING AND USEFUL? (Y/N)

4. DO YOU FEEL THAT MOST NEW PERSONNEL SHOULD BE ASSIGNED TO VECB PRIOR TO BEING ASSIGNED TO MMT? (Y/N)

5. DO YOU FEEL THAT A MISSILE MAINTENANCE TECHNICIAN GAINS JOB KNOWLEDGE BY BEING ASSIGNED TO VECB PRIOR TO BECOMING A DISPATCHING MISSILE MAINTENANCE TECHNICIAN? (Y/N)

6. IN YOUR OPINION WHAT IS THE EFFECT OF LONG TTB WAITING TIME (MORE THAN TWO MONTHS) ON 41131'S?

THE FOLLOWING QUESTIONS WERE ASKED OF THE NCOIC'S ONLY

7. WHAT TYPES OF DUTIES ARE USUALLY ASSIGNED TO NEW 41131'S?

8. DO YOU HAVE A FORMAL PROGRAM DESIGNED FOR NEW ARRIVALS? WHAT DOES IT CONSIST OF? (Y/N)

9. HOW ARE NEW 41131'S ASSIGNED AT YOUR WING?

Appendix C: VECB OIC/NCOIC Telephone Population Survey

1. HOW LONG HAVE YOU BEEN IN MISSILE MAINTENANCE?

2. WOULD YOU PREFER TO GET AN UNTRAINED MISSILE MAINTENANCE TECHNICIAN (41131) RIGHT OUT OF TECHNICAL SCHOOL OR A TRAINED MISSILE MAINTENANCE TECHNICIAN (41151) FROM MMT? WHY? (3/5)

3. DO YOU FEEL THAT PERSONNEL WHO ARE ASSIGNED TO VECB UPON ARRIVAL FROM CHANUTE HAVE HIGHER MORALE THAN THOSE PERSONNEL WHO ARE INITIALLY ASSIGNED TO MMT? (Y/N)

4. DO YOU FEEL THAT A MISSILE MAINTENANCE TECHNICIAN GAINS JOB KNOWLEDGE BY BEING ASSIGNED TO VECB PRIOR TO BECOMING A DISPATCHING MISSILE MAINTENANCE TECHNICIAN? (Y/N)

5. DO YOU FEEL THAT MOST NEW MISSILE MAINTENANCE TECHNICIANS SHOULD BE ASSIGNED TO VECB? (Y/N)

6. IN YOUR OPINION, WHAT ARE THE ADVANTAGES OR DISADVANTAGES OF ASSIGNING ALL NEW 41131'S TO VECB AS OPPOSED TO ASSIGNMENT IN MMT?

THE FOLLOWING QUESTION WAS ASKED OF THE NCOIC'S ONLY

7. HOW ARE NEW 41131'S ASSIGNED AT YOUR WING?

Appendix D: Training Control Division NCOIC and TTB/MMT Supervisor Telephone Population Survey

1. HOW LONG HAVE YOU BEEN IN MISSILE MAINTENANCE?

2. DO YOU FEEL THAT PERSONNEL WHO ENTER TTB WITHIN TWO MONTHS OF ARRIVAL FROM CHANUTE ARE MORE MOTIVATED THAN THOSE WHO AWAIT TRAINING IN MMT FOR MORE THAN TWO MONTHS? (Y/N)

3. DO YOU FEEL THAT NON TEAM CHIEF 411X1 PERSONNEL WITH PREVIOUS EXPERIENCE IN VECB MAKE BETTER TECHNICIANS? (Y/N)

4. IN YOUR OPINION, WHAT IS THE EFFECT OF A LONG TTB WAITING TIME (MORE THAN TWO MONTHS) ON 41131'S?

Appendix E: Contingency Table Overview

Definition

A Contingency (Crosstabulation) Table is a

> joint frequency distribution of cases according to two or more classificatory variables. The display of the distribution of cases by their position on two or more variables is the chief component of Contingency Table analysis and is indeed the more commonly used analytic method in the social sciences. These joint frequency distributions can be statistically analyzed by certain tests of significance, e.g., the chi-square statistic, to determine whether or not the variables are statistically independent (34:218).

Purpose

> Often it is desirable to summarize the relationship depicted in a crosstabulation table with a measure of association or a test of statistical significance. A measure of association indicates how strongly two variables are related to each other. . . . a measure of association indicates to what extent prior knowledge of a case's value on one variable better enables one to predict the case's value on the other variable (34:222).

A major problem encountered when analyzing count data concerns the independence of two methods of classifying the events that have been observed. Contingency Tables have been designed to test this independence. For example, we want to classify quality control evaluations (HQ's, Q's, UQ's) according to rating and to whether or not the technician had experience in VECB prior to entering TTB initial technical training. The object then becomes to investigate a contingency, or a dependence, between evaluation ratings and experience.

Description

In order to build a Contingency Table, the count data must first be identified and sorted into cells.

> If the two classifications are independent of each other, a cell probability will equal the product of it's respective row and column probabilities in accordance with the multiplicative law of probability (30:637).

The general form of a Contingency Table is reproduced in Table XXV.

TABLE XXV
General r x c Contingency Table (29:734)

		COLUMN				ROW
		1	2	...	c	TOTALS
ROW	1	n_{11}	n_{12}	...	n_{1c}	r_1
	2	n_{21}	n_{22}	...	n_{2c}	r_2
	.	.	.	.	.	.
	.	.	.	.	.	.
	.	.	.	.	.	.
	r	n_{r1}	n_{r2}	...	n_{rc}	r_r
COLUMN TOTALS		c_1	c_2	...	c_3	n

Once the table has been built, expected cell frequencies are computed based on the assumption that the classifications are independent using the formula $r_i c_j / n$. At this point, testing of the null hypothesis against an alternative hypothesis takes place.

> The null hypothesis specifies only that each cell probability will equal the product of it's respective row and column probabilities and therefore will imply independence of the two classifications. The alternative hypothesis is that this equality does not hold for at least one cell (30:638).

The general test used in Contingency Table Analysis is reproduced in Figure 13.

H_0: The two classifications are independent

H_a: The two classifications are dependent

TEST STATISTIC

$$X^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} [\, n_{ij} - E(n_{ij}) \,]^2 / E(n_{ij}) \qquad \text{where} \quad E(n_{ij}) = r_i c_j / n$$

REJECTION REGION

$X^2 > X^2_{\alpha}$, where X^2_{α} is based on $(r-1)(c-1)$ degrees of freedom.

ASSUMPTION

The sample size n will be large enough so that for every cell, the expected cell count $E(n_{ij})$ will be equal to five or more.

Figure 13. General Form of a Contingency Table Analysis: A Test for Independence (29:734)

The chi-square test is used to calculate the value of the test statistic. Degrees of freedom are computed based on $(r-1)(c-1)$ degrees of freedom. The test statistic is compared against the critical value of chi-

square table value for computed degrees of freedom and level of significance (30:712). The level of significance is important since

> With a test of statistical significance we learn the probability that the observed relationships could have happened by chance, i.e., the probability that in a representative sample of a given size the variables would exhibit a relationship as strong as the observed relationship (34:222).

Appendix F: Telephone Interview Data

This appendix provides the data which was collected from the telephone interviews conducted during the data collection phase of this research. Because of the private nature of these responses and evaluation ratings, this data will be presented generically as base A, participant 1, etc.

The first key provides the information necessary to understand the codes used to record the responses received in the Enlisted Personnel survey (Appendix A).

Enlisted Personnel survey key (Appendix A)	
A1-F14	the first character indicates the base and the number designates the personnel interviewed at that base
VECB	an X indicates initial assignment to VECB
TTB	an X indicates completed TTB/MMT initial technical training
AWT	an X indicates awaiting TTB/MMT initial technical training
QC	an X indicates inclusion in Appendix G
MONTHS	indicates the number or months awaiting training in MMT prior to starting TTB. In the case of AWT it indicates the number of months currently waiting to enter TTB
Q3-Q6	yes/no keyed to questions 3-6 in Appendix A
Q7	keyed to question 7 in Appendix A, B=boring, H=halls and walls, P=parts runs, S=squadron details

Enlisted Personnel Survey Results

	VECB	TTB	AWT	QC	MONTHS	Q3	Q4	Q5	Q6	Q7
A1	-	-	X	-	1	Y	N	Y	Y	H
A2	-	-	X	-	5	Y	N	N	N	H
A3	-	-	X	-	5	Y	N	N	N	H
A4	-	X	-	-	6	Y	Y	Y	Y	H
A5	-	X	-	-	6	N	Y	Y	Y	H,B
A6	X	X	-	-	2	Y	Y	N	N	H

VECB	TTB	AWT	QC	MONTHS	Q3	Q4	Q5	Q6	Q7
B1	-	X	-	-	6	Y	N	N	N	S
B2	-	X	-	-	5	Y	N	N	N	H
B3	-	X	-	X	2	Y	N	N	N	H
B4	-	X	-	X	9	Y	N	N	N	B
B5	X	X	-	-	1	Y	Y	Y	N	S
B6	-	X	-	X	4	Y	N	N	N	S

VECB	TTB	AWT	QC	MONTHS	Q3	Q4	Q5	Q6	Q7
C1	X	X	-	X	2	Y	Y	N	N	H
C2	X	X	-	-	1	Y	N	N	N	H
C3	-	X	-	-	11	N	Y	N	N	B,S
C4	X	X	-	-	2	Y	N	N	N	H
C5	X	X	-	-	1	N	N	N	N	H
C6	X	X	-	X	1	Y	N	N	N	H

VECB	TTB	AWT	QC	MONTHS	Q3	Q4	Q5	Q6	Q7
D1	-	-	X	-	2	N	Y	N	N	H
D2	-	-	X	-	2	Y	N	Y	N	S
D3	-	-	X	-	3	N	N	N	N	H
D4	-	X	-	-	4	N	Y	N	N	B
D5	-	-	X	-	3	Y	N	N	Y	B
D6	X	X	-	-	2	Y	Y	N	N	H
D7	X	X	-	-	1	Y	Y	N	N	H
D8	-	X	-	-	8	N	N	N	N	P,H
D9	-	X	-	-	8	Y	Y	N	N	B,H
D10	X	X	-	X	1	N	N	N	N	H
D11	X	X	-	-	2	Y	N	N	N	H
D12	-	X	-	-	7	Y	N	Y	Y	P
D13	X	X	-	-	2	Y	N	N	N	H

VECB	TTB	AWT	QC	MONTHS	Q3	Q4	Q5	Q6	Q7
E1	X	X	-	-	2	N	N	N	N	B
E2	X	v	-	X	4	Y	N	N	N	S,H
E3	X	X	-	-	2	N	Y	N	N	H
E4	-	X	-	-	1	Y	N	N	N	H
E5	-	X	-	X	4	N	N	N	N	B,H
E6	-	X	-	X	5	N	N	Y	N	S
E7	-	X	-	-	3	N	N	N	N	H
E8	-	X	-	X	7	Y	N	N	N	P
E9	X	-	X	-	3	Y	N	N	N	B,H
E10	X	-	X	-	1	Y	N	N	N	H
E11	-	-	X	-	1	N	Y	N	Y	H
E12	-	-	X	-	1	Y	N	N	N	H
E13	-	-	X	-	1	Y	N	N	N	H
E14	X	X	-	-	2	Y	N	N	N	B
E15	X	X	-	-	2	N	N	Y	N	B

VECB	TTB	AWT	QC	MONTHS	Q3	Q4	Q5	Q6	Q7
F1	-	X	-	X	3	N	N	Y	Y	H
F2	-	X	-	X	2	Y	N	N	N	H
F3	-	X	-	X	5	Y	Y	N	N	H,S,B
F4	-	-	X	-	4	N	Y	Y	Y	B,H
F5	-	-	X	-	3	Y	N	N	N	H
F6	-	X	-	X	3	N	N	Y	N	S,H
F7	-	X	-	X	4	Y	N	N	N	H
F8	-	-	X	-	3	N	N	Y	N	B
F9	-	X	-	-	3	N	Y	N	N	H
F10	-	X	-	-	6	N	N	N	N	S,B
F11	-	X	-	-	3	N	N	N	N	B
F12	-	X	-	-	6	N	N	N	N	B
F13	X	X	-	-	2	Y	N	N	N	H
F14	-	X	-	-	6	N	Y	Y	Y	H,B

This second key provides the information necessary to understand the codes used to record the responses received in the three supervisory surveys (Appendices B-D).

supervisory survey key (Appendices B-D)	
A-F	indicates the base of the person interviewed
EXP	years of experience in missile maintenance
Q2-Q9	keyed to questions in applicable Appendix B,C, or D
ADV	advantages
DISADV	disadvantages
H and W	halls and walls (section and squadron clean-up details)

Training Control Division NCOIC and TTB/MMT Supervisor
Telephone Population Survey

DIVISION
NCOIC's

	EXP	Q2	Q3	Q4
A	22	Y	Y	no effect
B	21	Y	N	lose tech school knowledge
C	8	Y	N	attitude is worse
D	21	Y	Y	demotivates, lose tech school knowledge
E	21	Y	Y	must be remotivated, lose training state of mind
F	19	Y	Y	decreased motivation, harder to restart training

TTB/MMT
NCOIC's

	EXP	Q2	Q3	Q4
A	5	Y	N	forget what they learn in tech school
B	6	Y	N	lack motivation, need reorientation
C	13	Y	N	no effect
D	9	Y	Y	decreased morale, want to start and can't
E	4	N	Y	lower morale
F	7	Y	N	lose interest

MMB OIC/NCOIC Telephone Population Survey

OIC's	EXP	Q2	Q3	Q4	Q5	Q6	
A	2	Y	N	Y	Y		bad for morale
B	2	Y	Y	N	Y		lower morale
C	1	Y	N	N	N		lower morale, expectations not met, lose technical expertise
D	2	Y	N	N	N		none
E	2	Y	Y	N	N		no productivity
F	1	N	N	N	N		none

NCOIC's	EXP	Q2	Q3	Q4	Q5	Q6	
A	19	Y	N	N	N		low morale
B	12	Y	Y	N	Y		personnel get burned out, discouraged, have bad attitudes
C	16	Y	N	Y	Y		lower morale, loose interest
D	16	Y	Y	Y	Y		none
E	19	Y	N	Y	Y		develop bad attitudes, more personal problems
F	9	Y	N	Y	Y		personnel are disallusioned

NCOIC's	Q7	Q8	Q9 HOW ASSIGN
A	Sixth man, Parts runs	Y-Ancillary training, Sixth man, Parts runs	MMT first
B	Details, Shop duties	N	By need
C	H and W	N	By need
D	Ancillary training	N	VECB first
E	H and W, Parts runs	Y-Ancillary training, Sixth man	MMT first
F	Ancillary training, Sixth man	Y-Ancillary training, Sixth man	VECB first

VECB OIC/NCOIC Telephone Population Survey

OIC's	EXP	Q2	Q3	Q4	Q5	Q6 ADV	DISADV
A	9	5	N	Y	Y	licenced quicker	none
B	5	5	N	Y	Y	none	none
C	6	5	Y	Y	Y	experience, job knowledge	none
D	8	5	N	Y	Y	provides a job	turn over
E	2	5	N	Y	N	provides a starting point	holding pen for MMT
F	1	5	Y	N	N	none	need training

NCOIC's	EXP	Q2	Q3	Q4	Q5	Q6 ADV
A	20	3	Y	Y	N	job knowledge
B	15	3	N	Y	Y	provides experience
C	15	5	Y	N	N	provides experience
D	16	3	Y	Y	Y	gives VECB a personnel mix
E	10	3	N	N	N	none
F	20	5	N	N	N	none

NCOIC's	Q6 DISADV	Q7 HOW ASSIGN
A	none	MMT first
B	turn over	By need
C	need training	By need
D	none	VECB first
E	none	MMT first
F	not enough job knowledge	VECB first

Appendix G Quality Control Evaluation Data

This appendix provides the data which was collected from the six Quality Control Divisions during the data collection phase of this research. Because of the private nature of these evaluations ratings, this data will be presented generically as base A, participant 1, etc.

This key provides the information necessary to understand the codes used to portray the data received.

Quality Control evaluation rating key	
A1-F10	the first character indicates the base and the number designates personnel ratings at that base
MONTHS	months refers to months awaiting TTB in MMT
VECB	indicates initial assignment in VECB
INIT	indicates Initial Quality Control evaluation ratings
1ST YR	indicates First Year Quality Control evaluation ratings
H,Q,U,	H=highly qualified, Q=qualified, U=unqualified

	MONTHS	VECB	INIT	1ST YR
A1	14	-	HHQ	HQQQ
A2	1	-	HQQ	QQQQ
A3	5	-	HQQ	QQQQ
A4	5	-	QQQ	HQQQ
A5	5	-	QQQ	QQQQ
A6	7	-	HHQ	HQQQ
A7	5	-	HQQ	QQQQ
A8	5	-	HHQ	HQQQ
A9	9	-	QQU	QQQQ
A10	7	-	QQQ	QQQQ
	6.3		9H 20Q 1U	4H 36Q 0U

	MONTHS	VECB	INIT	1ST YR
B1	6	-	QQQ	HHQQ
B2	5	-	HQQ	HHQQ
B3	2	-	QQQ	HHQQ
B4	9	-	HQQ	HQQQ
B5	3	-	HQU	HHQU
B6	4	-	QQQ	HHHQ
B7	2	-	HQQ	HHHQ
B8	13	-	HQQ	HHHQ
B9	13	-	HQQ	HQQQ
B10	2	-	QQQ	QQQQ
	5.9		6H 23Q 1U	19H 20Q 1U

MONTHS VECB INIT 1ST YR					MONTHS VECB INIT 1ST YR				
C1	2	X	HQQ	QQQQ	D1	3	-	HQQ	QQQQ
C2	2	X	HHQ	HQQQ	D2	1	X	QQQ	QQQQ
C3	14	X	HQQ	QQUU	D3	1	X	QQQ	HHHQ
C4	3	X	QQQ	HQQU	D4	5	-	QQU	QQUU
C5	1	X	HHH	HHHQ	D5	4	-	HHH	QQQQ
C6	1	X	QQQ	HHHQ	D6	2	X	HQQ	QQQQ
C7	1	X	HHH	HHHQ	D7	3	-	QQQ	HQQQ
C8	1	X	HHQ	HQQQ	D8	6	-	QQQ	HQQQ
C9	1	X	HQU	HHQQ	D9	1	X	HHQ	HHQQ
C10	1	X	HHQ	HHQQ	D10	1	X	HQQ	HQQQ
	27		15H	16H		27		8H	8H
			14Q	21Q				21Q	30Q
			1U	3U				1U	2U

MONTHS VECB INIT 1ST YR					MONTHS VECB INIT 1ST YR				
E1	2	X	QQQ	HHHH	F1	3	-	HQQ	HHHH
E2	4	X	HQQ	HHQQ	F2	2	-	HHH	HHQQ
E3	4	X	QQU	HHQQ	F3	5	-	HQQ	HQQQ
E4	2	X	QQU	HQQQ	F4	3	-	HHQ	HQQQ
E5	4	X	QQQ	QQQU	F5	8	-	HHQ	HHQQ
E6	5	X	HQQ	HQQU	F6	3	-	HHQ	HHQQ
E7	1	X	QQU	HQQU	F7	4	-	QQQ	HHQQ
E8	7	X	HQQ	QQQQ	F8	2	X	HQQ	HHQQ
E9	5	X	QQU	QQQQ	F9	2	X	QQQ	QQQQ
E10	1	X	QQQ	HQQU	F10	5	-	HQQ	QQQQ
	35		3H	12H		37		13H	16H
			23Q	24Q				17Q	24Q
			4U	4U				0U	0U

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This research examined the effects of excessive TTB initial technical training waiting time on Missile Maintenance Technician (41131) morale and proficiency. In performing this research, the Minuteman Missile maintenance environment was throughly examined. A literature review of several training and motivational theories, and their applicability to the Air Force training environment was also conducted.

The methodology developed for this research utilized Contingency Table analysis to test several categories of data at the .05 level of significance. These categories included Initial and First Year evaluation ratings by TTB waiting time, by initial technician assignment and by supervisor rank and experience. To gather data for these categories, Minuteman Missile Maintenance Technician (411X1) Initial and First Year Quality Control evaluation ratings were collected for a sample of 60 technicians. In addition, four telephone surveys were employed to gather data concerning TTB waiting periods, technician morale and utilization. These four surveys consisted of a technician sample survey and three supervisory population surveys.

The research findings indicate that excessive TTB waiting time (more than two months) in MMT prior to beginning TTB result in decreased morale and reduced proficiency on First Year evaluation ratings. These findings indicate that initial assignment of all 41131's to VECB is not only possible, but advisable, due to the decreased morale and proficiency that result from excessive waiting in MMT prior to beginning TTB initial technical training.

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